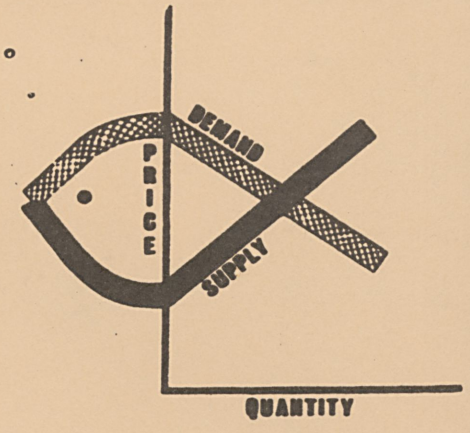

ANALYSIS OF THE DISTRIBUTION SYSTEM FOR NORTHWEST-ORIGINATED FRESH AND FROZEN SALMON

Volume I

by

Philip B. Schary
Robert E. Shirley
B. Linn Soule

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ANALYSIS OF THE DISTRIBUTION SYSTEM FOR NORTHWEST FRESH AND FROZEN SALMON

Volume I

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Philip B. Schary
B. Linn Soule
Robert E. Shirley

School of Business and Technology
Oregon State University
Corvallis, Oregon

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ABSTRACT

ANALYSIS OF THE DISTRIBUTION SYSTEM
FOR NORTHWEST-ORIGINATED FRESH AND FROZEN SALMON

This study discusses the description and analysis of the distribution system for fresh and frozen Pacific salmon. It is concerned not only with the identification of the product movement, the types of firms involved and their functions in the distribution channel, but also the reasons for the specific form of development that the channel has taken. The first part of the analysis identifies the size and trends of the catch of the specific species which enter the fresh and frozen product market, primarily coho and chinook salmon. It then measures the allocation of the catch by product form whether fresh, frozen, canned or appearing in other forms. As a final unit of the analysis, the trends of world consumption of Pacific salmon are estimated.

The second part of the analysis describes the actual distribution process of salmon, measuring first the volume of flow of product to market, then examining the actual structure of the distribution channel, and finishing with an analysis of price-making behavior within the channel. The impression of structure which emerges is one of an openly competitive arrangement among firms, although there are some contractual links between firms at successive stages which place limited restriction on the ability

of firms to move from one market to another. From observations of price-making within the industry, channel performance appears to be reasonably competitive but the degree to which this is true could not be directly ascertained from the available data.

The third part of the analysis describes the channel arrangements for the physical movement of salmon to market. The physical distribution channel for salmon involves other sets of firms than the exchange channel, where the actual buying and selling takes place. These firms operate under different constraints than those in the exchange channel, necessitating specialized decisions and channel relationships.

The succeeding sections of the analysis describe the specific inputs necessary for the development of a simulation model: the physical processes which take place by species and stage, and the related description and analysis of costs of channel operation. Costs and revenues were developed both by stage and for the channel as a unit. This analysis requires the identification of both the direct costs and those which cannot be assigned to any species or product form.

The culmination of this project was the development of a simulation model to describe channel processes and operations in a form suitable for analysis. While there were many possibilities for the actual form of the simulation, the actual choice was dictated by the area of potential interest to the greatest number

of potential users. As a result the market allocation process was selected because it dictates the flow of product to market. While the model thus developed is limited to this task, it permits interaction with the market environment through changes in relevant parameters. Further, the structure of the model permits development toward greater complexity.

The model thus developed is a profit-seeking (but non-optimizing) deterministic FORTRAN computer model of the pricing and distribution of fresh and frozen salmon for the industry as a whole. Supply, assumed to be entirely dependent on catch volume, interacts with demands in several markets to achieve an allocation of product, involving two species in three sizes and a separate frozen product which in a second version is considered to interact with the fresh market. Prices paid to fishermen, the length of the season, margins to sell to different areas, and the demand schedules for these areas are assumed and can be exogenously varied. The model will generate information on total volume over the season or by week by area, species and product form in both weight and dollar value.

The model was run using experimental data testing the effects of both demand shifts (such as those which might be attributed to either changes in taste or to the effectiveness of promotional campaigns) and variations in channel margins. It has demonstrated its capability to reflect parameter changes as they affect product flow, measuring the gross impact of fundamental shifts in

ACKNOWLEDGEMENTS

This study owes much to the dedicated efforts of our graduate assistants. Programming of the simulation was done in large part by Paul Converse. Much of the financial statement analysis was performed by Marvin Murphy. Charles Rause and James Taylor, through their willingness to assume responsibility, carried out a considerable share of the interviewing of the firms in the survey. The advice and knowledge of the industry provided by William Jensen gave all of us a sense of orientation which would have been otherwise difficult to obtain within such a short period of time.

In addition we would like to thank the participants in our survey, the officers and employees of the 107 firms in the survey who gave so freely of their time and information, the departments of fisheries or fish and game for the States of Alaska, California, Oregon, and Washington, and the Province of British Columbia for their data and advice, the marine extension agents of the Oregon State University Sea Grant Program, and the field staff of the National Marine Fisheries Service in Seattle.

To all of the individuals who gave their cooperation, we can only hope that this study matches their expectations.

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Corvallis, Oregon
October 7, 1970

environmental conditions. This research began in the latter part of 1968 and was completed by the middle of 1970.

Chapter I

INTRODUCTION

How do salmon move to market? Fresh and frozen salmon are part of a small group of products within a larger category identified as seafood products. All of these are distributed through a complex process involving intricate networks and relationships of firms and functional activities. What is important is that these firms and activities become organized in some sense to achieve a common goal, the movement of a product to market. To trace the specific distribution patterns of salmon products, and even more narrowly of fresh and frozen salmon, recognizes that every product involves a unique system organized to connect a source of supply through the offices of independent and quasi-independent units with the markets for that product.

The purpose of this study is to describe the fresh and frozen salmon distribution system, first from the standpoint of how the system operates today, and second by using computer simulation to understand and predict the behavior of the distribution system as an entity. This project is confined to a single group of products in order to identify the unique elements, the specific relationships, and the decisionmaking processes involved within one operating distribution system. While this study has taken a narrow focus, there are, however, many

characteristics of this system which appear to be common to many seafood channels. By intensive study of the one operating channel, this project may contribute to the collective knowledge of channels in general.

The study of marketing channels for seafood products has been a neglected area of study, and particularly so for salmon. Far more attention has been paid to the production and conservation of commercial fish than to the process by which fish are brought to market.[1] If included at all, marketing has been treated as an appendage to the production process. Even more specifically, there has been an almost complete neglect of seafood channels of distribution. While a few studies have been concerned specifically with seafood distribution, only three, to our knowledge, have been directly concerned in any way with Pacific salmon.[2] DeLoach's

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1 Crutchfield, James A. and Giulio Pontecorvo, The Pacific Fisheries: A Study of Irrational Conservation, Baltimore, Md.: Johns Hopkins, 1969, and Maurice E. Stansby (ed.), Industrial Fishery Technology, New York: Reinhold, 1963.

2 DeLoach, C. B., Trade in Fresh and Frozen Fishery Products and Related Marketing Considerations in the San Francisco Bay Area, Bureau of Fisheries Investigational Report No. 35, Washington, D.C.: Government Printing Office, 1938. Also see "Organization for Economic Cooperation and Development," Price Systems at the Landing Stage in Fishing Industries of OECD Member Countries, Paris: OECD, 1966. For an excellent discussion of seafood marketing in the United Kingdom, see Taylor, R.A., The Economics of Sea Food Distribution in Great Britain, London: Duckworth, 1960. Also see Le Commercialisation du Poisson en France, Paris, 1967.

study was regional in orientation, examining the seafood channel structure for the San Francisco Bay area. The channels that he studied included all seafood marketed in the area, and were not concerned exclusively with salmon.

Gregory and Barnes[3] studied the market channel for canned salmon as the major product form of the salmon industry. They mentioned the movement of fresh and frozen salmon but gave it only minor importance in their study. The OECD price study concentrated on price-making at the landing stage only, and for salmon it was concerned principally with the markets in Alaska. While the study of fresh and frozen product distribution may have been safely neglected in the past, it is becoming more significant as the general market demand for fresh and frozen seafood rises in world markets.[4] The timing of this study is therefore appropriate to examine the state of distribution of fresh and frozen salmon not only out of concern for the marketing of salmon per se, but as part of a general effort to understand what is happening in seafood marketing today.

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3 Gregory, Homer E. and Kathleen Barnes, North Pacific Fisheries, New York: Institute of Pacific Relations, Organization for Economic Cooperation and Development(OECD), 1939, Chapter VIII, pp. 205-210.

4 Organization for Economic Cooperation and Development, The Market for Frozen Fish in OECD Member Countries, Paris: OECD, 1969.

Organization

This study is divided into four parts: the industry background, a description of the channel structure, a description of the channel processes, and the simulation model of the channel. The chapter which follows will describe the economic background of the industry in terms of the way in which salmon are caught, the product forms generated, and consumption trends in the world market.

The succeeding three chapters describe the channel itself. Chapter III discusses the organization of the channel, starting with an estimate of product flow, examining the level of concentration by stages within the channel, testing behavior in the vertical market through price and inventory behavior, and drawing inferences about behavior of the market and its performance. Chapter IV describes the logistics link within the channel, examining both physical process characteristics and the resulting effect on the market. Chapter V describes the process flow characteristics of the channel, beginning with the distribution channel activities of the fisherman, and continuing through the successive stages to the final retailer. It also includes descriptions of both the brokerage and the transportation functions. For each stage we will describe both the physical processing and the demand creation activities which, in this case, refer primarily to the price-making function.

Chapter VI is a study of the costs and profits of each specific stage. This provides a basis for assessing the market

performance of the channel. In addition, a model of fish processing cost will be presented as a basis for developing cost standards for fish processing.

The final three chapters of the study will develop a computer simulation model of the flow of product through the channel. Given certain values of price and channel margins, the model will allocate the volume of fish production to markets on the basis of a searching process for profit maximization for the channel as a whole. Under conditions where channel costs and demands are changing, the model enables the effects of decisions taken within the channel and shifts in the outside environment, as reflected in economic variables, to be measured on the physical flow through the channel itself. Chapter VII will describe the structure of the model, while Chapter VIII will present the results of tests of the model using hypothetical values. It should be pointed out that the objectives of the simulation are limited. It cannot generate a complete replication of all channel processes in all of the detail which we have noted in the earlier chapters. There are limits on elaboration in both the time and effort for programing, and the costs of actually running the model. However, the model can be expanded to include, for example, the operating details of individual stages, such as the inclusion of a process flow at the production stage or changes in demand for differing product form. This simulation can be considered a foundation on which other elements can be added as necessary.

Definitions for this Study

In order to clarify at the outset what this study will cover, the following definitions and specific boundaries will be stated.

Species - Pacific salmon are produced in the West Coast States of California, Oregon, Washington, Alaska, and the Canadian Province of British Columbia. Pacific salmon include five species: chinook, coho, chum, pink and sockeye. Chinook and coho salmon have been traditionally used for fresh and frozen product forms.[5] However, in recent years, the other species have also been marketed in this form. Fresh pink salmon have appeared in large quantity in the retail markets of the Pacific Northwest; frozen sockeye have been sold in large numbers to Japan; frozen chum salmon have been marketed as steaks. Frozen pink and chum salmon have reached European markets in significant amounts. Nevertheless, the principal species in fresh or frozen product form, and the ones used for analysis in this study, remain the chinook and coho salmon.

Product Form - Both fresh and frozen product forms are included here because they move through similar, if not always identical, channel processes. While mild-cured, smoked, and pickled salmon products are derived from the fresh and frozen product forms, they will be given only a limited treatment, because in many cases they follow a distinctly different path to market. Canned salmon will be excluded, although it is the dominant salmon

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[5] Yonker, Water V., "The Salmon Fisheries" in Stansby, op. cit., p. 107.

product form by weight sold because both the physical processing and the distribution channels differ significantly from the fresh and frozen channel.

Channel - The term "channel" includes all of the activities encompassed within the distribution process from the time the fish are caught until they are sold at the retail counter. There are several institutional forms which comprise the channel, including:

Receiving stations--where the fish are received from the fishermen and the initial purchasing transaction is made.

Processors--the place where "production," i.e., physical transformation into the various product forms, takes place. Processors normally make claim to the fish in order to sell the products to other stages in the channel. These firms are sometimes referred to as "primary wholesalers."

Wholesalers--these firms mainly serve the function of distributing fish to local and regional markets. They are also known as "secondary wholesalers" or "purveyors."

Other institutions--the end member of the channel is of course a retailer, restaurant, other consuming institution. Retailers may be divided into general food retailers, such as supermarkets and specialist seafood dealers. The intermediary in many markets between processor and wholesaler or even retailer is the broker who is involved in bringing buyer and seller together. The

physical distribution function includes both carriers and cold storage warehouses. The former include a special category of motor carrier operations known as "agricultural" or "fishery exempt" carriers which as interstate service do not have to comply with the economic regulations of common or contract carriers. Public cold storage warehouses are privately or publicly owned facilities to hold and sometimes perform production processing activities on fish without taking title to the fish.

The "customary channel" is a vertical chain from fisherman to receiving station, to processor, to purveyor, to retailer, linked together by direct contract or through brokers, and by the transportation, storage, and processing of the physical product. It is immpossible to associate any channel functions uniquely with any one stage in isolation, to identify one stage as exclusively production and another as distribution. The production processes are relatively simple and may be performed in several stages. The marketing functions may also be performed in any number of stages, even when dealing with the same market. As we shall note later, processors may sell either to wholesalers, retailers, or the general public, a mixing of functions which makes clear-cut classification of firms and activities extremely difficult.

Data - Two principal sources of data were used for this project: information from governmental and industry sources, and a direct survey by interview with individual firms active in the

processing and distribution of fresh and frozen salmon. The published information sources came from the following public agencies:

U.S. Government

National Marine Fisheries Service - Circulars:

Commercial Fisheries Statistics Series
Fishery Statistics of the United States
Market News Service, data compiled from the Seattle, New York City, and Chicago Offices

Bureau of the Census

Census of Business
U.S. Export Trade

Customs Bureau

Exports and imports by Customs District

State of Washington

Washington Fish Commission - Annual Report
Special Tabulation - Taxable Fish Sales by Dealer - Washington Fish Commission

State of Oregon

Unpublished data - Taxable fish sales by Dealer - State of Oregon

State of Alaska

Department of Fisheries Annual Report

State of California

California Department of Fish and Game Annual Report
Special Tabulation - Taxable Fish Sales by Volume by Dealer - State of California

Canada

Exports

International

F.A.O. Annual Yearbook of Fishery Statistics
International North Pacific Fish Commission

Nongovernmental Sources

National Fisherman Yearbook (formerly Pacific Fisherman)

The survey data was taken by direct interview using the interview form shown in appendix F-1 (Volume II) covering 107 firms distributed by function and area as follows:

Table 1-1

Firms Interviewed During Survey - 1969

Area	Receiving Stations	Processors	Wholesalers	Retailers	Brokers	Transport Carriers	Total
California		7	9	2	3		21
Oregon	3	10	15	6		9	43
Washington	1	10	9	6	8	2	36
Alaska		4	1		1		6
British Columbia		1					1
Total	4	32	34	14	12	11	107

In designing this survey, the objective was to achieve a coverage as complete as possible in the processing stage with reasonable coverage of other stages, recognizing that because of time and budget, the degree of market coverage would necessarily decline as the survey moved closer to the final retail stage in the channel. Both retail and wholesale practice in the East and Midwest would be expected to display some variance from the observed behavior in the Northwest, but this was not determined firsthand from the interviews.

The questionnaire was sufficiently comprehensive to identify details of both production and distribution practices, costs, and

processes for each stage. Naturally there was a varying degree of response to this survey, and the data presented here in most cases does not cover all firms. However, the data appear to be representative and reflect what, by all appearance, is typical practice within the industry.

The Objectives

The focus of this study is on the entire distribution process for the movement of fresh and frozen salmon to market, embracing all of the firms, functions, and activities involved in the process from the time of the catch until the product is placed on sale at the retail counter. Most of the emphasis, however, will be placed on those activities beginning with the receiving station where the catch is first transferred to shore, and those of processing and distribution to subsequent owners.

In a study of an entity as complex as an organization of independent firms and activities defined as a marketing channel, there are several questions which need to be answered:

1. What activities and functions are involved in the channel and where are they located? While some activities are technologically determined and cannot be shifted, others will appear to be footloose so that they can be located in a number of possible places. One purpose of this study is to identify these latter activities and the causal factors behind their present location in the channel.[6] In this study we have

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6 See Louis P. Bucklin, "The Economic Structure of Channels of Distribution," in Martin L. Bell (ed.), Marketing: A Maturing Discipline (Chicago: American Marketing Association, 1960), pp 379-385.

identified two types of channels, one for exchange, i.e. negotiation, buying and selling, the other to carry out the physical processing and distribution functions necessary to move products to market. The location of specific functions such as contact with buyers and distribution from intermediate resellers has changed over time; we have sought to identify reasons for these changes.

2. Because the distribution channel is in fact a vertical market system, what elements of cooperation and conflict appear in the relationships between firms and channel stages?[7] The structure of the channel in both its vertical and horizontal dimensions has been examined in the course of this study. Competition at the processor level, for example, is manifested in rivalry for market share through large-scale buying activity for resale. It is also evident in the cooperative relationships which have been established between processors and receiving stations through both direct ownership and contractual relationships. It has also led to less formalized tying arrangements with fishermen through devices such as "boat accounts" as a way to secure the selling preference of fishermen.

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[7] See Richard G. Gettell, "Pluralistic Competition," in Bruce E. Mallen (ed.), The Marketing Channel (New York: John Wiley, 1967), pp 109-113 and Bruce E. Mallen, "Conflict and Cooperation in Marketing Channels" in L. George Smith (ed.), Reflections on Progress in Marketing (Chicago: American Marketing Association), pp. 65-85.

At the same time there are extensions of the conflicts between institutional forces which have long dominated American food marketing. As supermarkets have taken over more of the retail food trade, they have reached backward toward sources of supply. While they have been content to let local wholesalers handle their fresh salmon, they have increased their direct buying activities with the processors for frozen salmon. The role of the local retailer has disappeared and that of the local wholesaler has become less important. The function of buyer contact which was once held by brokers has declined significantly. These intermediate institutions in the salmon channel are in danger of disappearing.

3. What are the relevant costs and profits incurred within the channel and where do they tend to accumulate? Many studies of distribution have voiced concern over the costs involved, in response to a public suspicion that "distribution costs too much."[8] In this study we have endeavored to measure both costs and returns of firms at each stage in the channel in order to establish the current status of the industry and to determine the costs of the various processes and operations in distribution. Further, we have examined

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8 P.W. Stewart, J.F. Dewhurst and L. Field, Does Distribution Cost Too Much? (New York: Twentieth Century Fund, 1939); for a later study on the same theme see Reavis Cox, Charles S. Goodman, and Thomas C. Fichandler, Distribution in a High-Level Economy (Englewood Cliffs, N.J.: Prentice-Hall, 1965).

the costs of distribution as a whole to exactly determine the cost of distribution of salmon from the source of supply to the final consumer.

4. What are the characteristics of the channel as a system when the outputs of all stages are combined to produce one end result? The salmon distribution channel in one way appears to be quite flexible in responding to changing environmental conditions. The computer simulation which is a major part of this study is a demonstration of the ability of the channel to restructure the flow of product to meet new market situations. On the other hand the management of the industry has been slow to adapt to new technology. Even such simple changes as developing standard container sizes and common grading systems to reduce the multiple handling problems have been resisted within this industry as impractical. Management information systems, such as standard cost reporting procedures are rarely found in the industry, and a major failing in improving the efficiency of market processes has been the lack of adequate information on the state of current market transactions.

5. How can the operation of the channel be improved? First, this study can contribute to a broader understanding of the changes taking place within the channel as a result of changes in geographic and product form markets. Second, by identifying the weaknesses and inadequacies of current management practice, several specific recommendations can be made to remedy the problems. This study presents

a prototype model of a cost estimating system for a fish processor, developed after direct observation of processing operations, which is not only potentially useful as it stands, but which can serve as a guide for studies in other areas of seafood distribution. The simulation model mentioned above can also provide direction both as a forecasting and as a planning tool. In forecasting, by taking certain parameters as given, the flow of products and prices can be estimated. By changing parameters, the sensitivity of demand to changes in operating practice may be estimated. It thus provides a place to test the impact of potential innovation within the channel, or the ultimate impact of changes in demand before they occur in the market.

This study incorporates several forms of analysis. The identification of the sequence of activities in the channel will be studied through the development of process-flow structures for each stage and function in the channel. The channel organization and interfirm relationships will be approached through analysis of both the horizontal and vertical market structures. The measurement of cost and returns will be made from direct observation, interviews, and inference from accounting data. Finally, the comprehensive view of a channel will be described by a simulation studying the effect of demand and channel parameters on product flow.

The power of this analysis is not in the use of any one technique alone, but more in combination. Each approaches the

phenomenon of channel behavior from a differing perspective. In combination, the object is to create an understanding which goes beyond the confines of any one approach to the study of channel behavior and performance.

Conclusions

Supply of Salmon:

1. Coho and chinook salmon, which are the principal species in the fresh and frozen salmon markets, originate in four states and Canada with more than half of the total originating in British Columbia.

2. The method of catch determines the location of processing facilities. Trolling, which involves cleaning of fish at sea, is more extensively practiced south of Puget Sound than it is to the north.

The Markets for Salmon:

3. The market is shifting from canned to fresh and frozen product forms.

4. The markets for fresh and frozen salmon are concentrated in relatively few countries: the United States, Canada and the countries of Western Europe.

5. Estimated product flow for 1968 shows that of a total American catch of coho and chinook of 66 million pounds (round-weight), 37 million pounds (dressed weight) are finally distributed in fresh or frozen form, with approximately equal markets in the West Coast, the rest of the United States and Europe, principally Britain and France.

The Distribution Channel

6. The distribution channel can be divided into two sets of vertically-related organizations: the "exchange" channel concerned with negotiation and transactions, the other concerned with the physical flow of product to market.

7. There is little evidence of vertical integration in distribution channels, aside from the control by processors through ownership or contract of receiving stations.

8. The number of fishermen is increasing despite declines in earnings suggesting changes in the occupational structure of this group.

9. Although measurable data on processor operations does not indicate high levels of concentration, there is evidence of large-scale buying operations for resale.

10. Wholesaling of salmon is declining because of both high costs and the trend for large retail buyers to deal directly with large processors.

11. The large retail chains represent a balance to the possible market power of the large processor. Based on the available evidence, price making behavior in the channel appears to be reasonably competitive.

Physical Distribution

12. Physical distribution involves allocations between costs of holding versus those of movement. There are distinct differences between cost allocations for frozen versus fresh salmon.

13. The product form is crucial to determination of the physical distribution channel; the available evidence, however, fails to describe what factors have been important to managers in making this decision.

14. The type and quality of transportation limit the extent of the market for fresh salmon to the West Coast which is served primarily by truck, while air travel is used to serve selected points in the rest of the United States.

15. Frozen processing is limited by the availability of cold storage facilities. Once frozen, however, salmon moves freely without the geographic constraints of fresh salmon.

16. The motor carrier is the dominant form of transport for domestic frozen product movements; almost all interstate truck shipments are performed by carriers exempt under the Fisheries Exemption of the Transportation Act of 1958.

17. There is little standardization of containers, and multiple handlings are common in distributing salmon.

18. The lack of adequate marketing information is a major handicap to the efficient movement of salmon, both for buying and selling, and for control over the physical distribution system performance.

Costs and Returns

19. Fishermen earn low or negative returns. However their contribution margins are sufficiently high (about 50 percent) to maintain growing numbers in operation.

20. Receiving stations operate with average costs of 3 to 4 cents per pound.

21. Processor earnings do not appear to be high; two firms for which data was available reported earning a 3.1 and 11.7 percent return. Based on contribution margin calculations salmon appears to be more attractive than other species. Costs of processing were calculated, indicating that the direct costs for fresh salmon are about one-third and frozen salmon about one-half of the direct costs of canned salmon.

22. Returns from wholesalers were between 5 and 7 percent, while margins were between 14 and 17 percent.

23. Most retailing of salmon occurs through supermarket meat counters. Margins have been about 20 percent, while handling costs have been estimated to be about 15 percent.

24. Total costs for channel operation are based on a system involving retailing in a Northwest metropolitan area, and 44 percent of the total retail price. The directly assignable costs were about 16 percent, the difference being the unassignable overhead costs. This body of unassignable costs is then allocated by the vertical price structure.

25. Evidenced by the inadequate information available for decisions, the quality of management would appear to be of low quality.

Simulation Model

26. A nonoptimizing, deterministic model of pricing and distribution behavior of the salmon channel was developed.

Described as an information generator, it will indicate the volumes and prices obtained in six markets for six different product forms, given predetermined parameters for demand, costs, catch, volume, and catch prices. The model assumes that the landed or ex-vessel price and the required markup price can be determined. If demand exceeds supply, it will raise the price until the market will absorb the entire supply.

27. Two alternate models were developed and tested; one assumes that fresh and frozen are not competitive, and will distribute supply over a 40-week cycle. A second model assumes that they are competitive with each other, and the model simulates a 52-week cycle involving shipping fresh or frozen to markets depending on cost.

28. Two demonstration test runs have been provided, involving a) a change in markup and b) a change in demand. The results indicate that the model can measure the effects of changes in either parameter, and is thus potentially capable of measuring the impact of markets and channel costs on product measurement.

Recommendations

1. The salmon industry, and presumably this applies to other seafood industries as well, suffers from a lack of adequate information. While data on catch statistics are plentiful, there is little information available on the costs or returns from processing and distribution operations. Programs to develop data on economic aspects of fishery operation, and in this case on distribution, should be undertaken in order to provide some form of guidance to management in this industry.

2. Studies of costs undertaken in this investigation indicate that direct costs of processor operation can be measured precisely. The techniques developed here should be applied elsewhere in order to provide reference data for managers faced with economic decisions such as product choice or market alternatives.

3. Programs to develop cost reporting and monitoring systems for processing firms should be undertaken with assistance to these operators in implementation so that they can achieve better operating efficiency.

4. Fish wholesalers would appear to need help in establishing costs and improvement of operations. If wholesale firms are to survive, they must be as efficient as their larger competitors. Therefore we would recommend similar programs to assist these operations.

5. Efforts in this study to identify at a macro level the nature and structure of the product form decisions as currently practiced by processor managements have not been successful. In order to provide a better understanding, and to improve management practice in this area, further study of the decision at a micro, i.e. firm, level including both economic and non-economic factors would be useful.

6. One major problem affecting the industry is the lack of comprehensive and current market information. The usefulness of the Market News Service bulletins declines as the distance

from the disseminating office increases. We recommend the study of possible application of electronic market information systems to this industry, based on an analysis of needs of the industry and possible alternative solutions to the problem.

7. The physical distribution system contains multiple handlings of fish from one container to another. This is wasteful, not in the loss of fish, but in the labor cost involved. We recommend study of the feasibility of introducing a standard grading system in order to avoid the multiple inspections now being required. Further, we also recommend investigation of the development of a common container system compatible with all relevant modes of material handling, so that fish may pass from vessel to store with a minimum of rehandling.

8. The returns in the salmon industry at all stages do not appear attractive. In all probability these firms are operating under severe capital constraints, although this was not studied during our survey. It is important to understand the financial problems of this industry, and therefore we recommend two studies in this area: (1) development of rate of return data for this industry through study of firm operations and (2) development of operating function models which will define the rates of return under present conditions. Further, we would argue that it is important at this time to examine sources of financing these firms.

9. Further extensions of the simulation model are recommended to incorporate the operating characteristics of individual functional processes. The model in its present form is extensive in coverage,

describing the entire channel but at a macro level. While the effect of change both in markets and distribution technology can be incorporated through variation in the demand elasticities and markup parameters, introduction of process detail would permit a more direct evaluation of technological change on the profitability of the industry.

10. Even within the present model structure, however, there are several areas of potential application for this simulation which because of budget and time constraints could not be explored. One is the effect of demand shifts in various markets on the demand for fresh and frozen salmon products. The effect of change in the slopes and positions of demand curves in these markets could be measured in the differences in product volumes moving to specific markets. For example, one hypothesis suggests that given sufficient volumes in markets with a highly inelastic demand, under conditions of reduced supply there would be almost complete elimination of consumption in price-elastic markets. Alternately, given highly elastic demand schedules in all markets, the model could be used to derive the maximum prices that could be paid to fishermen or other members of the distribution channel.

11. Because the data for most model parameters were not directly available, the model presented here was based on estimated data from the study and by subjective estimates. Considerable refinement of these estimates is then called for to improve the

realism of the results of the model operation. Alternately, ways of reducing the information requirements of the model have been proposed which would require minor changes in the model program.

Chapter II

SALMON PRODUCT FORMS: PRODUCTION AND MARKETS

The distribution channel for salmon is ultimately constrained by four environmental factors:

1. where salmon are caught;
2. how they are caught;
3. the extent of the market by product form; and
4. the location of the markets for fresh and frozen salmon.

The first two constraints are supply-oriented, determined within the catch process itself; and, because of conservation restrictions, they are interrelated. All California salmon are troll-caught and hence are normally eviscerated on board the vessel; in contrast to other areas where alternative methods of catching salmon are practiced, and the fish-cleaning operation is accomplished in the processor's plant. These two factors then determine the geographic location of the processing functions within the channel.

The next two constraints are the results of consumer taste, and are also interdependent; tastes vary from one market to another. The possibility of supplying fresh or frozen salmon to each market is limited by the physical distribution facilities available. Fresh salmon has been limited to local areas and markets served by relatively high cost but short transit-time air transportation. Channel activities then are fixed by the location and characteristics of the market, and supply is limited by what is possible to deliver within the channel.

Product demand, strictly speaking, refers to the relationships between quantities taken by the market, prices paid, and incomes. No attempt will be made in this study to estimate price or income elasticities. While this is certainly relevant to a study of salmon distribution, as the simulation model in chapters VII and VIII will demonstrate, it lies beyond the scope of this investigation. Further, the data problems associated with demand estimates in the multitude of product and geographic markets become so large that realistic estimates based on data available to this study would be extremely difficult, if not impossible.

The data collected for this chapter cover the period 1956 to 1966, the latter year being the latest for which complete data are available. Where more recent statistics are available, they have also been included. The period of 10 years appears to be a reasonable period to measure trends. The technology of both processing and distribution has been relatively slow to change, and there would seem to be little significance in extending this period to an earlier year.

The Catch

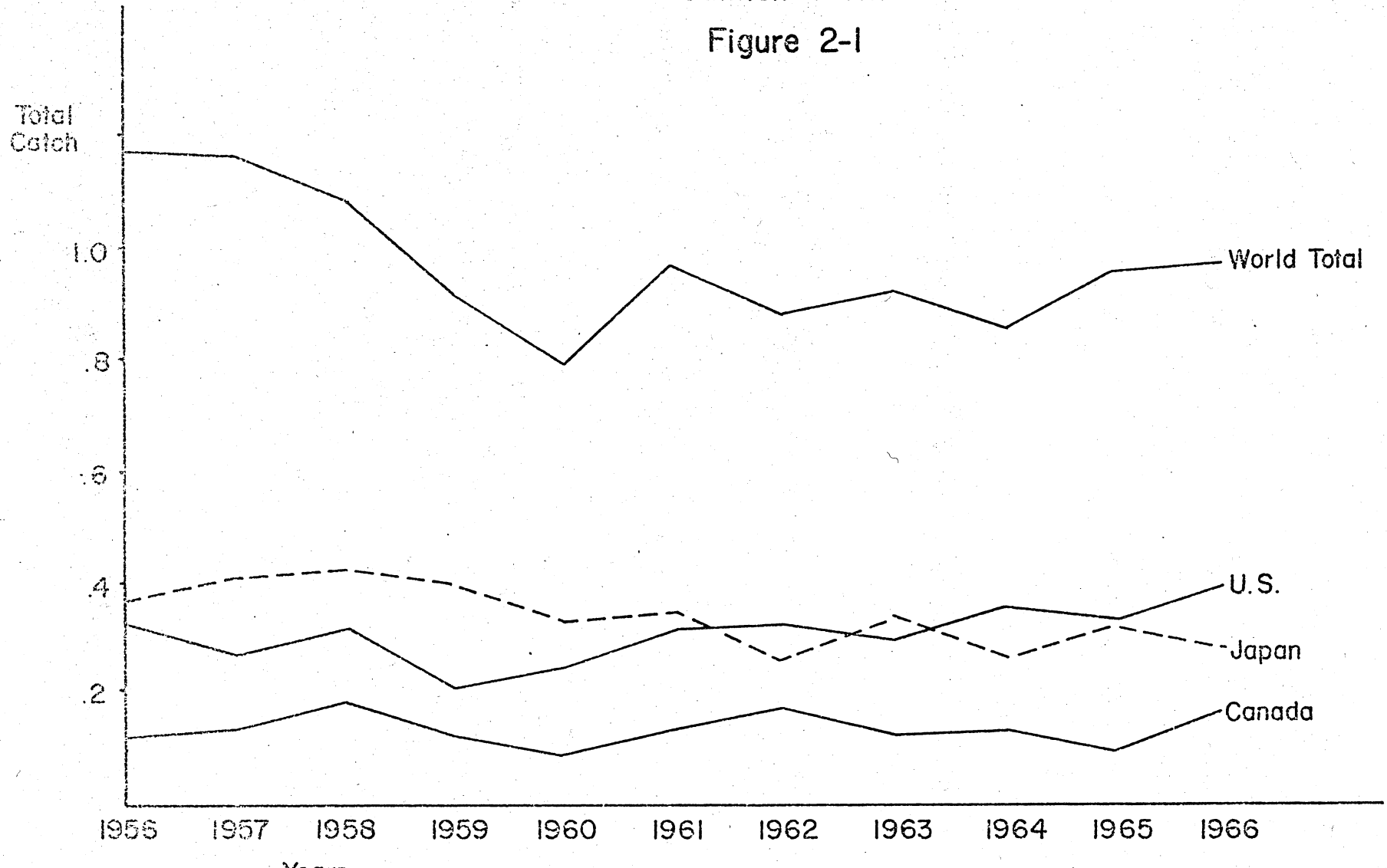
The characteristics of the catch are of interest for two reasons. First, the geographic distribution of the catch volume identifies the geographic location of the initial stage in the channel. The proximity of the catch to processors and markets will dictate the types of facilities which must be provided and will

also determine in some measure the structural characteristics of the industry. Second, the type of gear used will determine the type and location of processing functions. Troll-caught salmon are conventionally cleaned in the boat because of the dangers of spoilage as a result of delayed evisceration. Because of tradition and location of fishing grounds relative to processing activities, on-board evisceration is not normally done in gill-netting and seining operations, and as a result, the fish must be brought into a processing station with a minimum amount of delay. The cleaning activity is thus located on shore rather than at sea.

Data on the world production of Pacific salmon are provided in appendix table A-1 and summarized in figure 2-1. Because of the random nature of the salmon species, runs tend to be cyclical and erratic and the volume will vary considerably by country and time. The distribution of species by country is uneven, and of the four countries engaged in salmon production, the Japanese produce the largest total volume of salmon; however most of this is concentrated in pink salmon. Their catches of both chinook and coho are smaller than those of either the United States or Canada. The dominant producers of salmon species of the fresh and frozen markets of the world are the United States and Canada. In fact, from the FAO data there is no reported volume of frozen salmon being exported from either Japan or the Soviet

World Commercial Pacific Salmon Catch

Figure 2-1



Source: Appendix Table A-2

Union.[9] This is not true in canned species; the Japanese are the largest canners of pink salmon, and a major share of this production is exported.

The distribution of the salmon catch among the four Pacific States--Alaska, California, Oregon, and Washington--and British Columbia is described in table 2-1. For a typical year (the most recent year for which full data were available was 1966), the distribution of coho and chinook species by States and Province are as follows:

Table 2-1

Distribution of Catch, Coho and Chinook, by State and Province

1966

State/Province	(Million Pounds) round weight Chinook	Coho	Total	Percent
Alaska	9.4	16.1	25.5	21.3
California	8.3	1.1	9.4	7.8
Oregon	3.7	8.7	12.4	10.3
Washington	5.9	12.8	18.7	15.6
British Columbia	15.3	38.7	54.0	45.0
TOTAL	44.0	85.7	120.0	100.0%

Source: appendix table A-2

[9] Data obtained from the United Kingdom Ministry of Agriculture Food and Fisheries indicate that in 1968 only 700 pounds of frozen salmon were imported from Japan and none from the U.S.S.R.

Because salmon are sold in a world market and also because several American firms are active in British Columbian fisheries, it is logical to consider the American and Canadian supply as a unit. British Columbia obviously dominates the total, followed by Alaska. The three remaining States only contribute 33.2 percent of the total catch. The location of the catch is shown in table 2-2, indicating the relative importance of each district for chinook, coho and the total of all salmon. Despite fluctuation in the data, there appear to be no pronounced changes in the relative proportions over the period 1956-1966. To indicate the importance of each area, data for 1966 are recapitulated in the summary table--table 2-2.

The dominance of British Columbia is again indicated in all species, although the degree varies considerably. In chinook, the major catch areas aside from British Columbia are southeastern Alaska, western Alaska, the Columbia River, and northern California. Coho appear to be caught over the entire region with the exception of California and western Alaska. Chinook and coho are more important to California, Oregon, and Washington than to Alaska and British Columbia. Although the latter dominate salmon production in all species, the volume of the other salmon species is more significant than those of coho and chinook salmon.

The manner in which salmon are caught will dictate where the first channel production process, the evisceration of the fish,

Table 2-2

Salmon Catch by Area - 1966
Percent of Total Round Weight

Area	Chinook	Coho	All Species
British Columbia	36.8%	55.2%	39.4%
Alaska - Southeastern Area	10.8	9.5	5.3
Central Area	1.3	6.3	27.3
Western Area	9.9	1.3	17.8
Total Alaska	22.0	17.1	50.4
Washington - Puget Sound	4.8	4.9	2.8
Coastal District	4.4	5.6	1.6
Columbia River	3.2	3.3	0.8
Oregon - Columbia River	7.0	6.5	1.7
Total Columbia River	10.2	9.8	2.5
Total Oregon-Washington	21.2	26.2	8.0
Total Oregon	8.8	12.4	2.8
Total Washington	12.4	13.8	5.2
Northern California	14.6	1.2	1.6
San Francisco Area	4.7	0.4	0.5
Southern California Area	0.6	0.0	0.1
TOTAL	100.0	100.0	100.0

Source: appendix table A-3

takes place. Troll-caught salmon are cleaned at sea, because the vessels tend to stay out more than a few hours and the spoilage process is enhanced if the fish are not cleaned as soon as possible. In table 2-3, the portions of the catch caught by troll gear for chinook and coho by area are presented for 1966. (For data for the period 1956-66, see appendix A-4.) For both chinook and coho areas (with the exception of central Alaska, the Columbia River, and in recent years, the Puget Sound), the major share of salmon are caught by troll. For these areas, then, the cleaning process is not a processor function but that of the fisherman instead. Where salmon are caught by gill net and seine, processors must take on the cleaning function as well. Because of the flexibility of most fish processor operations, this task can be added or not, depending on the source of fish for the day.

In general, there is a lower proportion of troll-caught coho than of chinook salmon. The major exception to this has been the Columbia River area. The Washington Columbia River chinook catch is predominantly a troll catch, while the major share of the Oregon Columbia River chinook are caught by gill net. In coho salmon, there is a higher percentage of troll-caught coho for the Oregon fishermen. In this area of the Columbia, there appears to be a shift away from trolling as a method of catching salmon.

Table 2-3

Troll-Caught Salmon as a Percent of Total Weight of Salmon Landed - 1966

(% lbs. Troll-Caught)

Area	Chinook	Coho	All Species
British Columbia	67.8	62.9	23.7
Alaska - South Eastern Area	95.1	69.7	41.1
Central Area	2.0	0.6	0
Western Area	0	0	0.1
Washington - Puget Sound	35.2	38.1	17.6
Coastal District	52.6	90.8	68.0
Columbia River	24.6	60.9	48.5
Oregon - Columbia River	6.2	65.5	15.7
Oregon Coast	100.0	100.0	100.0
California - All Areas	100.0	100.0	100.0

Source: appendix table A-4 (all species)

Product Form

Salmon is produced and marketed under four major product forms: fresh, frozen, canned, and cured. Production and import data of the major salmon producing countries are shown in table 2-4. Data on import volume are included with the production data because production processes may take place on both domestic and imported fish. From other sources the Canadian data appear to be the most complete of the four countries whose data appear in the table in terms of product delineation. The data on product form by Japan and

the U.S.S.R. for internal consumption are not available for this study. The volume of fresh product for the United States was estimated, as these data are not available in published form. The estimating procedure involves some possible error, as it relies on product conversion from round weight, although a check against Canadian data showed that it was reasonably close.[10]

Production figures for the U.S. and Canada involve an unspecified degree of double counting because of the nature of the production process. Fresh salmon can be transformed into either frozen or canned product forms, and frozen salmon can be changed into either canned or mild-cured product forms. As long as the product stays within the originating country, this double counting will be minimal. Fresh and frozen inventories would be expected to clear at least once a year, and annual data would therefore reflect final product forms with only negligible error.

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[10] The estimating equation used to derive fresh volume in dressed form is as follows:

$$y = x_1(1/85) + x_2(1/82) + x_3(1/62) + x_4(1/82)$$

when x_1 = fresh product weight dressed
x_2 = frozen product weight dressed
x_3 = canned product
x_4 = cured product form
y = total volume in round weight

However, a substantial volume of fresh and frozen salmon crosses the border between the United States and Canada in both directions. Products which are reported as fresh and frozen in one country can be converted into another product form in the other; therefore combined production estimates and hence the estimates,of supply available for world consumption,are subject to some potential and undetermined error.

Table 2-4

Salmon Product Available for Distribution - 1966
(Thousands of Pounds)

	Production	Import	Total
Fresh	26,016	1,761	27,810
Frozen	15,703	6,532	22,235
Canned	209,023	589	209,610
Cured	12,569	131	12,700
			272,355
Canada			
Fresh	7,118	1,323	8,441
Frozen	25,772	2,725	26,197
Canned	87,263	2,205	89,468
Cured	790	--	790
			127,896
Japan			
Fresh	--	--	--
Frozen	441	2,425	2,866
Canned	50,486	--	50,486
Cured	--	--	--
Unspecified	217,927	--	217,927
			271,279
USSR			
Canned	7,937		7,937
Unspecified	107,330		107,330
			115,269

Source: appendix table A-5

Over time few changes are clearly evident. The one significant change has been the reversal of positions in the production of fresh salmon between the United States and Canada. The American production volume in fresh product form has increased from an estimated 10.0 million pounds in 1956 to 20.5 million pounds in 1966, while the Canadian volume has declined from 8.1 to 6.7 million pounds. This may in part have been caused by a decline in rail express service accompanying the decline of the passenger train. It is more difficult now to move fresh fish directly from Canada to market within the United States, except within local areas or by air shipment. In addition one Canadian manager said that it was more profitable now to ship frozen salmon from Canada to Europe than to the U.S. or eastern Canada.

The exports of salmon products by country of origin are shown in table 2-5. The United States and Canada are the only sources of fresh Pacific salmon and the major sources of all types of salmon in world markets, although most of their volume is exported to each other. They are also the major sources of frozen salmon, although Japan has been a factor in this market. For canned salmon, the addition of Soviet Russia to this list includes all of the Pacific salmon exporting countries. The significant change which has occurred in the pattern of world salmon export markets is the rise of U.S. canned and frozen products, the latter within the last 2 years. While this suggests a relative decline in per capita

Table 2-5

Exports of Salmon Products by Country
(000 pounds)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
U. S.											
Fresh	1,764	1,676	1,102	1,543	2,866	1,102	1,543	4,850	22,560	1,323	2,425
Frozen										9,236	17,420
Canned	5,213	6,688	9,278	13,851	11,930	7,790	8,983	10,228	20,936	24,900	20,484
Cured	636	353	495	492	531	641	569	577	1,006		
TOTAL	7,613	8,717	11,175	15,886	15,327	9,533	11,095	15,655	44,502	35,459	40,329
Canada											
Fresh	5,952	8,598	15,212	10,362	6,173	4,850	2,866	3,086	1,984	1,543	1.764
Frozen	7,496	7,496	7,716	11,685	9,700	9,921	9,700	11,244	13,007	16,755	20,283
Canned	32,187	24,030	61,289	34,172	15,653	18,519	23,589	33,731	39,683	26,455	25,574
Cured	48	103	77	54	56	41	64	135	105	130	131
TOTAL	45,683	40,227	84,294	56,273	31,582	33,331	36,219	38,196	54,779	44,883	47,752
Japan											
Frozen	1,323	6,173	13,007	3,086	4,850	2,646	2,425	2,646	3,086	882	441
Canned	93,256	69,005	128,679	137,128	82,673	58,863	121,695	65,698	61,950	83,114	50,486
TOTAL	94,579	75,178	136,626	140,214	87,523	61,509	124,120	68,344	65,036	83,996	50,927
U.S.S.R.											
Canned	8,818	7,937	5,512	10,141	5,291	8,157	9,259	9,039	7,055	7,937	7,937

Source: United Nations Food and Agricultural Organization. Yearbook of Fishery Statistics, selected issues.

consumption of canned salmon product forms within the United States, the data fluctuate too widely to confirm this as a trend.

A more detailed presentation of trends in United States exports and imports is in table 2-6. Imports generally have declined in fresh, frozen, and most significantly in the canned product form. At the same time the United States has become a larger exporter than ever before. The data show increased exports in fresh, frozen, and canned product forms. Fresh and frozen product form exports have increased to the point where they are approximately equal in physical volume to that of canned products, which have also increased rapidly within the past few years. Whether this indicates a decline in U.S. domestic consumption can be seen in data on estimated consumption by product from within the United States (table 2-8). It should be noted that fresh and frozen exports are a major share of U.S. production, while the expanded volumes of canned salmon exports in the last few years are only a small fraction of total U.S. industry output.

The Consumption of Salmon Products

The consumption of salmon products was estimated for the world and also for major consuming countries under four basic product categories: fresh, frozen, canned, and cured (see appendix table A-6). Estimates were made by taking production figures by country, adding import volume, and subtracting exports. For two major consuming countries, Japan and the U.S.S.R., product form consumption data

Table 2-6

U.S. Salmon Imports and Exports
(1000 pounds)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Imports													
Fresh & Frozen	12,940	15,677	26,180	19,700	13,472	12,309	9,735	8,898	8,818	7,861	8,296	8,815	9,811
Canned	28,802	24,401	29,226	31,154	19,113	7,167	6,843	1,249	236	101	589	121	4,955
Cured	40	82	70	14	8	16	19	52	3	40	42	9	114
Smoked	8	21	7	40	48	25	45	83	102	90	89	51	40
TOTAL	41,862	40,181	55,483	50,908	32,641	19,517	16,642	10,282	9,159	8,092	9,016	8,996	14,920
Exports													
Fresh & Frozen	826	1,676	1,083	1,467	2,849	1,094	1,508	4,888	22,560	10,559	19,845	18,911	16,234
Canned	5,213	6,688	9,277	13,826	11,924	7,736	8,978	10,228	20,924	24,892	20,484	20,543	5,726
Cured	636	353	491	491	529	639	569	574	1,000				
TOTAL	6,675	8,717	10,851	15,784	15,302	9,519	11,055	15,690	44,484	35,451	40,329	39,454	21,960
Re-exports of Foreign Products													
Frozen			100	84	33	10	6	65	116	85	59	69	130
Canned			1	25	6	4	5		12	8	-	26	-
Cured			4	1	2	2		3	6				
TOTAL			105	110	41	16	11	69	134	93	59	95	130

Source: U.S. Bureau of Commercial Fisheries, now NMFS. Imports and Exports of Fishery Products, selected years.

were not available and consumption could only be classified as unspecified in form.

The trend of world consumption is probably better identified in percentage terms (as shown in appenxix table A-7). Worldwide consumption patterns are shown in summary form in table 2-7.

Table 2-7

Worldwide Consumption of Pacific Salmon Products
Three-Year Average Percentages by Weight, 1956-68 and 1964-66

Product Form	1956-8	1964-6
Fresh	6.7%	10.3%
Frozen	6.8	9.1
Canned	83.4	77.0
Cured*	3.2	3.5
TOTAL**	100.0%	100.0%
Fresh + Frozen	13.5%	19.9%

* Cured, smoked, pickled, and other processed forms may be understated in that fresh and frozen imports may be transformed in the importing country.

** Does not include unspecified consumption of Japan and the U.S.S.R.

Source: appendix table A-6

The data are arranged in three-year average percentage distributions by product in order to reduce the fluctuations inherent in data which are derived from production volumes.

These patterns clearly indicate a change from canned product forms toward fresh and frozen salmon. The specific reasons for

this change are not clear, although it can be argued that it is partly a result of changing taste which appears to be reflected in other species of fish as well. However it may also be a result of improved supply conditions in salmon distribution, suggesting that fresh and frozen fish are more easily moved to market and the end product may be superior to that of even 10 years previous.

When consumption data for the four principal countries are examined, a similar pattern can be noted for the United States, the United Kingdom, and France; only Canada has increased its share of canned salmon of the total salmon consumed within the country. These data are shown in table 2-8 which also indicates a rising worldwide market for fresh and frozen salmon product forms.[11] This may be surprising considering the relative costs of transporting these different forms to major importing countries such as the United Kingdom and France.

Summary

Four environmental factors determine the distribution channel for fresh and frozen salmon: the location and method of the catch, the extent of the market by product form, and the geographic location of these markets.

1. Pacific salmon are produced by four countries: the United States, Canada, Japan and the U.S.S.R. The species, however, vary considerably by country, and the principal species in the fresh and frozen product markets, chinook and coho, are

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[11] See OECD, The Market for Frozen Fish (OECD, Paris, 1968).

Table 2-8

Pacific Salmon Product Consumption by Major Consuming Countries 1956-58 Compared to 1964-66 Percentage Share by Product

Product	United States		Canada		United Kingdom		France	
	1956-8	1964-6	1956-8	1964-6	1956-8	1964-6	1956-8	1964-6
Fresh	7.9	13.8	16.2	13.5	0	1.1	--	6.4
Frozen	6.3	4.6	10.9	11.9	6.8	9.1	10.0	64.8
Canned	81.1	74.6	70.4	73.1	93.2	89.8	90.0	28.8
Cured*	7.8	6.9	2.6	1.5	--	--	--	--
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Fresh & frozen	13.2	18.4	27.1	25.4	6.8	10.2	10.0	71.2

* Much of the frozen salmon consumption in the United Kingdom and France may be in locally cured and smoked product form and is not reported as an imported product in those countries.

Source: appendix table A-7

found in all four of the Pacific Coast States and British Columbia. British Columbia clearly dominates the catch volume, followed by Alaska, Washington, Oregon, and California.

2. The method of catch determines the location of processing functions. There is a higher proportion of troll-caught chinook than of coho salmon. Further the incidence of troll-caught salmon in general is substantially higher for the California, Washington, and Oregon coasts, where alternative methods of catching are restricted, than for other regions.

3. While salmon is produced under four product forms, the available data indicate on a worldwide basis that there is a shift away from canned toward fresh and frozen product forms. There also appears to be a shifting regional emphasis in fresh and frozen production; Canadian production has been changing from fresh toward frozen forms because of the changing transportation alternatives, while American production has been moving toward fresh production.

4. The markets for fresh and frozen salmon appear to be concentrated among only a few countries. However, the rates of growth of these markets, combined with a relatively unchanging supply have created an environment in which prices have been rising because of the increasing quantities demanded by the export market.

Chapter III

The Distribution of Salmon

How do fresh and frozen salmon move to market? In this chapter, we will describe the process in two ways: first by estimating the physical volume of salmon moving from origin at dockside as the fish are received from the fishermen to the final resale markets to the consumer and second, by description of the channel in both structure and sequence of activities. The physical flows are estimated from interview data, combined with published information on catch volume, export volume, and the movement of salmon into the Chicago and New York City wholesale markets. Data on channel structure and market processes are derived from a combination of interviews and published data. After identifying and describing the market structure of the distribution of salmon, we will analyze the implications of channel structure on market conduct and performance. As a third and final test, we will consider the channel as a series of vertically-linked markets using published data to infer the nature of market behavior.

I. The Flow of Product to Market

A major objective of this study was to establish the direction and, if possible, some gross measures of the volume of salmon moving in both fresh and frozen form to major market areas. Considerable detail is available on the volume and direction of exports of salmon in various product forms both on a national basis and by customs

district within the United States. For domestic movement, both the New York and the Chicago offices of the Market News Service of the National Marine Fisheries Service (formerly U.S. Bureau of Commercial Fisheries) report the volume and origin of salmon entering their respective wholesale markets. Such data are not available, however, for other parts of the country; and further, they do not include what appear to be substantial movements of salmon outside of the wholesale channel, moving directly from processor to retail chain. Estimates of total movement of fresh and frozen salmon must therefore include other data which provide greater information about domestic movement.

To solve this problem, we surveyed through direct interview all Oregon and Washington salmon processors, the California processors representing the largest share of output in that State and a representative group of processors in Alaska and British Columbia. The survey interview (see appendix F-1, Volume II) requested specific information on sources and markets with some indication of relative volumes. Data made available were reported either by value or by weight, requiring transformation to a common basis. Because of differing area practice, allowance was made for the method of catch, whether troll or otherwise, as this affects the reported weight estimates. Normally the distribution of the catch by destination area was provided as an impressionistic

figure without recourse to documentation, and hence subject to error of respondent recall. Two of the larger firms in the industry were reluctant to identify their markets. Percentage distributions by destination area were developed by a process of aggregation by originating states for the 1968 season. When supplemented by published data, this provided a basis for making approximate measures of the volumes of movement. The specific method of calculation and the intermediate survey tables are described in appendix B-6. Chinook and coho salmon were used as the basis for calculation because other species only enter the fresh and frozen market on an erratic basis.

The final estimates of product flow are shown in figure 3-1 and the accompanying table 3-1. Briefly, we have estimated that from a total catch of 66 million pounds of chinook and coho salmon by the four States approximately 37.4 million pounds were available for distribution in fresh or frozen product form during 1968. To this was added 4.9 million pounds of imported salmon from British Columbia. Of this total, West Coast consumption is approximately 15.1 million pounds, that of the Midwest and East Coast is 12.0 million pounds, while total exports to all countries amounted to 15.2 million pounds. The most striking impression is the dominance of both the exports and East Coast markets as receiving areas for salmon products. The East Coast market volume is larger than that of any single local market and is also apparently larger than the combined urban markets of California; it would therefore appear to exert a dominant influence on prices in the total salmon market.

Figure 3-1
The Major Movements of Fresh and Frozen Salmon for the 1968 Season
(millions of pounds)

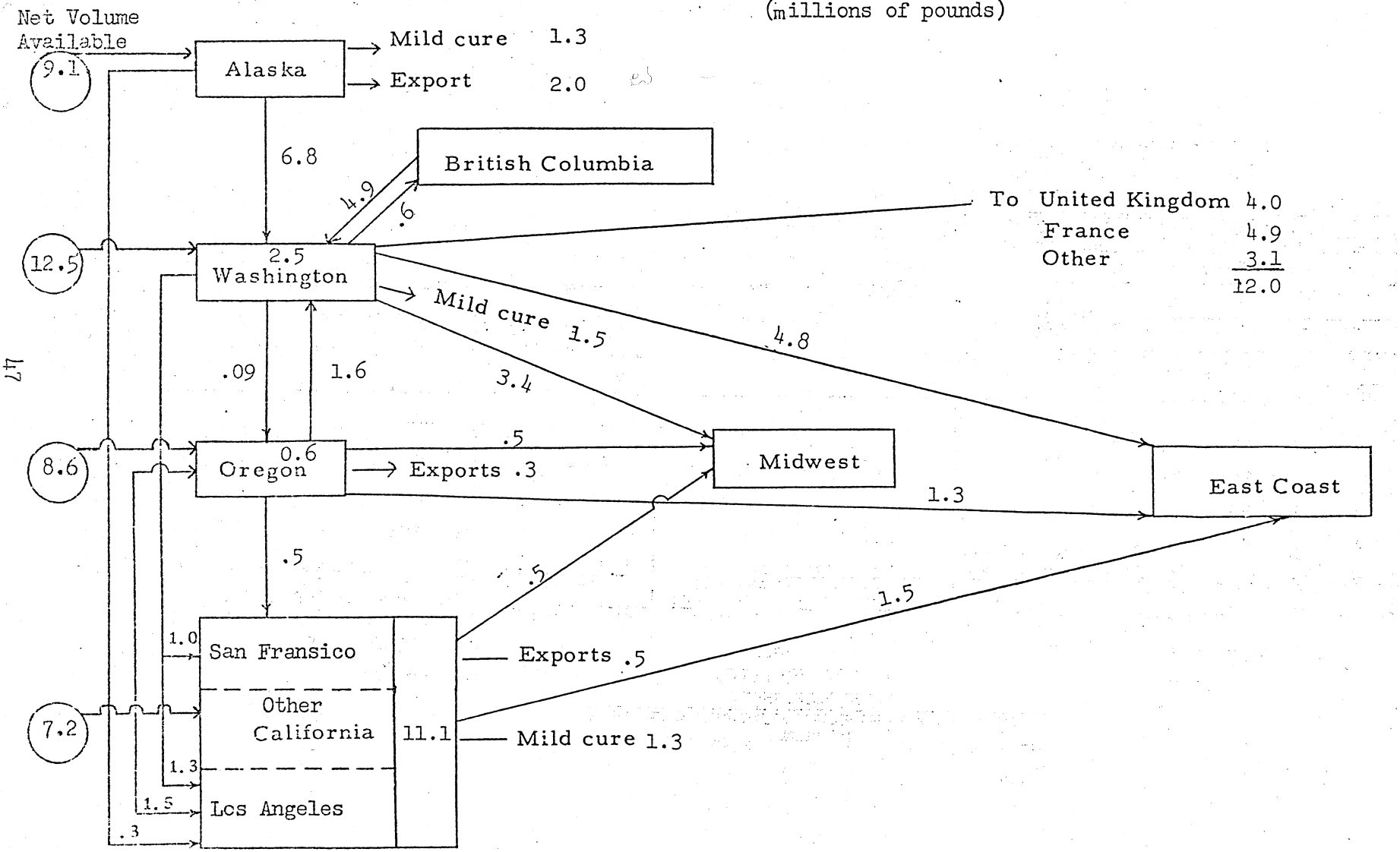


Table 3-1
Source and Destination of Pacific Coho and Chinook Salmon
As Estimated For 1968

(million pounds)

State of Origin	Product: Catch Volume	Shrinkage (1 - .85)	Canned Equiv.	Mild-Cure	Net	Imports	Net	Flow: Other Sources: Alaska	Wash.	Oregon	Net of Intermediate Source	Distribution: Destination Areas: Alaska	Wash.	Oregon	Calif.	MidWest	East Coast	Export	Total
Alaska	25.5	3.8	11.3	1.3	9.1	-	9.1	-	-	-	9.1	not estimated	6.8	-	.3	-	-	2.0	9.1
Wash.	16.7	2.8	1.9	1.5	12.5	4.9	17.4	6.8	-	1.6	25.8		2.6	.1	2.3	3.4	4.8	12.6	25.8
Oregon	12.4	1.9	1.9	-	8.6	-	8.6	-	.1	-	8.7		1.6	.8	4.4	.5	1.3	.1	8.7
Calif.	9.4	1.4	-	.8	7.2	-	7.2	.3	2.3	4.4	14.2		-	-	11.7	.5	1.5	.5	14.2
Total Product Form:	66.0	9.9	15.1	3.6	37.4	4.9	42.3	-Intermediate-				Total Distribution	11.0	.9	18.7	4.4	7.6	15.2	57.8
Distribution to other Source Areas.....								7.1	2.4	6.0	57.8		8.4	.1	7.0	-	-	-	15.5
Sum of Intermediate Transfers.....								15.5											
								42.3				End Consumption by Area.....	2.6	.8	11.7	4.4	7.6	15.2	42.3

Total West Coast Consumption 15.1

Source: See Appendix B-5, B-6, B-7

The magnitude of the two largest markets for exports, Britain and France, are also greater in size than any one urban market and would appear to be important contributors to the determination of prices and markets for salmon.

When the estimates of domestic movement are compared to the data reported for the Chicago wholesale market in table 3-2, we may note that the reported volumes are substantially below those of the estimated volumes from our survey. The differences may reflect either errors in estimation or the movements of salmon which do not pass through wholesale markets, such as the direct sales by processors to food store chains which are shipped directly to chain store warehouses. Data in table 4-15, chapter IV, indicate that the reported volume of salmon transported has declined by more than half from 1956 to 1966. In view of the high and increasing concentration of these chain stores in both purchasing and reselling to final markets, this discrepancy is not unexpected. As an additional factor underlining this discrepancy, we may also note the large shares held by British Columbia processors in these markets, contributing almost half of the volume in the Chicago market, and an even larger share in the New York City market.

The Direction of Export Trade

Data on export volume by country of destination and product form are available for both the United States and Canada, although the classification by products is slightly different between the

Table 3-2

Wholesale Market Sources - 1968
(Data in thousands of pounds)

Chicago:	State & Province:						
Species & Form	California	Oregon	Washington	Alaska	B. C.	Other	Total
Chum			0.1				0.1
Chum Frozen			24.5	71.7	325.3	--	421.5
Chinook	34.0	3.5	12.1		2.2		51.8
Chinook Frozen			27.0	135.9	30.3		193.2
Pink Frozen			6.0	8.6	4.7		19.3
Coho	4.8	9.5	42.1				56.4
Coho Frozen	1.0	8.0	79.2	74.0	24.2	6.2	192.6
Steaks			1.2		61.0		62.2
TOTALS	39.8	21.0	192.2	290.2	447.7	6.2	997.1

Source: National Marine Fisheries Service, Market News Service.

two countries. The United States data are available for both 1967 and 1968, while the Canadian data are limited to 1967 at the time of writing. A summary of the American data appears in table 3-3 and a Canadian summary in comparable form is shown in table 3-4. In general, they indicate the dominance of each country as a preliminary market for the other's fresh and frozen salmon. In combination, these two countries take 25 percent of the combined total, although some of this is undoubtedly reexported. The next most important receiving countries are the United Kingdom and France, which together account for about half of the total export volume of both countries. Substantially lower, but of major significance, are Sweden, Japan, Belgium, the Netherlands, and West Germany. The combined totals of these seven countries accounted for 94.18 percent of the total export volume in 1967.

Comparison of the 1967 and 1968 volumes indicate that there was little significant change in relative positions by country. While data from two years are not sufficient to establish a trend, they do suggest that these markets appear to have some stability over at least a shortrun period and that demands once established will tend to be maintained.

One ambiguity in the United States data has been the definition of what constitutes "fresh" salmon, and this has not been resolved to date by correspondence. In 1967, there were 2.4 million pounds of fresh salmon moving to overseas markets according to the published data; this declined to 737 thousand pounds in 1968. The

Table 3-3

Total U. S. Exports of Fresh and Frozen
Salmon 1967-1968

(thousand pounds)

Country	1967						1968					
	Fresh	Packaged	Total Fresh, Chilled	Frozen	Total	% of Total	Fresh	Packaged	Total Fresh, Chilled	Frozen	Total	% of Total
United Kingdom	105	--	105	4,530	4,635	24.5	79		79	4,281	4,360	26.8
France	322	120	442	4,775	5,217	27.6	31		31	3,948	3,979	24.5
Sweden				1,621	1,621	8.6				1,754	1,754	10.8
Japan	19	63	82	2,156	2,238	11.8				2,902	2,902	17.9
Canada	1,241	149	1,390	1,136	2,526	13.4	376	26	402	853	1,255	7.7
Netherlands				625	625	3.3				387	387	2.4
Belgium				667	667	3.5	51		51	620	671	4.1
W. Germany				443	443	2.3				196	196	2.1
Norway				54	54	0.3				34	34	0.2
Italy				15	15	0.1				13	13	0.1
Denmark		29	29	143	172	0.9				53	53	0.3
Switzerland				127	127	0.7				193	193	1.2
Australia		27	27	79	106	0.6				115	115	17.9
Other	49	290	339	126	465	2.4	14	90	174	158	332	2.0
TOTAL	1,736	678	2,414	16,497	18,911	100.0	621	106	747	15,507	16,244	100.0

Source: U.S. Bureau of the Census FT 410 Exports of the U.S.

Table 3-4

Total Canadian Exports of Fresh and Frozen Salmon - 1967

(thousand pounds)

Country	Fresh	Frozen	Total	% of Total
United States	1,755	6,463	8,218	35.6
United Kingdom	7	4,989	4,996	21.6
France		6,160	6,160	26.7
Sweden		778	778	3.4
Japan		47	47	0.2
Netherlands		544	544	2.4
Belgium	1	678	679	35.6
W. Germany		456	456	2.0
Italy		214	214	0.9
Denmark		435	435	1.9
Switzerland		79	79	0.3
Australia		121	121	0.5
Other	27	337	364	1.6
TOTAL	1,790	21,301	23,091	100.0

Source: Canadian Export Statistics, 1967.

movement of fresh salmon over such distances by other modes than air is difficult to perceive because of the long voyage times. However, air carrier statistics do not show fresh salmon to be a major commodity, and major shippers have commented that air shipment of salmon to European destinations began on a significant scale only in 1969.

The importance of individual areas for exporting to the market is shown in table 3-5, which identifies exports by product form and destination country. Seattle is the dominant source of exported salmon for all major importing countries. While there are some direct movements from Alaska, principally to Canada and Japan, the bulk of salmon ultimately exported passes through the Seattle Customs District. Other major ports are San Francisco and Portland, in that order. Both Los Angeles and New York are too far from a source of supply to be competitive exporting regions.

II. The Organization of the Marketing Channel

Having provided a measure of physical movement of fresh and frozen salmon to market, the next step is to describe the structure of the channel through which these product forms pass. A channel is a series of stages and links between stages by which the product moves to market. In the context of this study, the channel includes several stages: fisherman, receiving station, processor, wholesaler,

Table 3-5

Exports by Major Customs District - 1968
(000 lbs)

	Customs District:																				
	Seattle				Portland				San Francisco				Anchorage				New York				Los Angeles
Country	Fresh	Pack.*	Frozen	Total	Fresh	Pack.	Frozen	Total	Fresh	Pack.	Frozen	Total	Fresh	Pack.	Frozen	Total	Fresh	Pack.	Frozen	Total	Frozen
United Kingdom			4,042.0	4,042.0	79.0		51.6	130.6			113.2	113.2							20.4	20.4	3.4
France	20.0		3,472.3	3,492.3	10.0		108.2	118.2			278.0	278.0					1.0		41.7	42.7	
Sweden	51.6	20.5	1,632.3	1,704.4											6.1	6.1					
Japan	9.3		1,232.0	1,241.3											1613.3	1613.3					
Canada	249.9	3.4	338.6	591.9									70.3	0.5	278.4	349.7					
Netherlands	4.1		365.9	370.0			10.0	10.0													
Belgium	25.0		565.2	590.2	20.0	2.0	10.0	32.0			20.0	20.0					6.0		24.3	30.9	
W. Germany	4.1	5.0	119.6	128.7															77.9	77.9	
Norway			34.0	34.0																	
Italy			13.0	13.0																	
Denmark			48.0	48.0			5.0	5.0													
Switzerland			192.6	192.6																	
Australia			94.1	94.1					3.2		2.8	6.0									17.8
Other	--	--	30.4	30.4					1.1	2.1	25.8										14.5
TOTAL	364.0	28.9	12,180.0	12,572.9	109.0	2.0	184.8	295.8	4.3	2.1	497.0	503.4	70.8	0.5	1897.8	1969.1	7.0	--	164.9	171.9	35.7

*Packaged

Source: U.S. Customs District Tabular Reports.

retailer, and cold storage warehouse. The linking functions are performed either by firms within these stages or by additional firms: transportation carriers and brokers. For the most part, these firms appear to be characterized by both independent ownership and linking relationships which are open to change.

The channel processes appear to be divided into two parts, the exchange channel in which transfers of ownership take place through buying and selling operations, and the physical distribution channel by which products move to market. In this chapter, we will emphasize the exchange channel, as transactions of ownership transfer will determine the ultimate path of the product through the physical distribution channel. While we will offer a brief description here of the nature of the physical distribution channel, further discussion of the problem associated with the logistics of salmon distribution will be delayed until the next chapter. In passing we should take note that although we are separating the exchange and physical distribution activities, in reality we often find these two groups of functions operating through the same channel institutions.

A marketing channel can be described in several ways: as a set of systematic relationships; as a series of functional tasks which have to be performed; or as a set of institutions which can be arranged in structures, both horizontal and vertical. The first will be the ultimate goal of this study through simulation

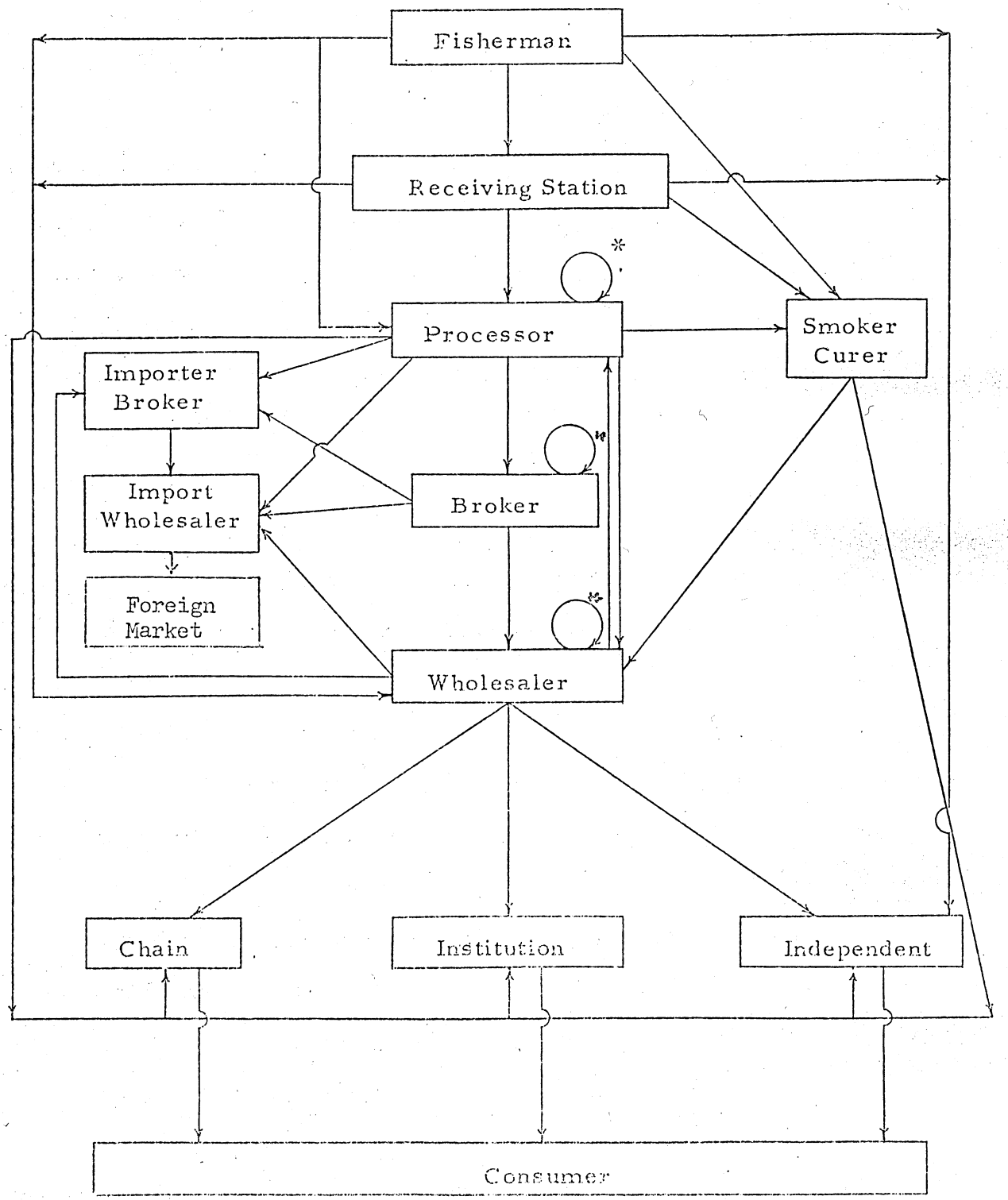
of the channel processes. The second and third are the tasks of this and the following chapter.

The exchange channel has the principal task of buying and selling, and therefore the principal functions are the transactions themselves and providing the information necessary for the transactions to take place. Because firms will only enter this industry to earn profits, profitability should indicate both structure and tendencies toward efficient performance. The exchange channel is described in figure 3-2. The customary form of this channel is from fisherman to receiving station to processor (also referred to by the trade as a "primary wholesaler") to the retailer. However, there is sufficient variety so that this describes only part of the distribution channel process.

Channel linkages as reported in the survey are shown in table 3-6. These linkages are reported as individual firms have described them. Because of unwillingness to disclose their business relationships or through other lapses in reporting, this may not include all of the relationships among respondent firms. However, they add further support to the heterogeniety of channel relationships described in figure 3-2. The principal channel relationships as expected are those of receiving station to processor, processor to wholesaler, and from wholesaler to retailer.

The most common variation in the past has been the intercession of the broker between the processor and wholesaler. The broker's role has been facilitative in that the broker does not ordinarily

"Negotiation Channels"



*Sold to firm at same level in channel.

take title or arrange processing of the salmon, but merely negotiates a transaction between a buyer and a seller.

Table 3-6

Linkages by Type in the Exchange Channel

To:		Processor	Wholesaler	Retailer	Broker
From:	Receiving Station	41	42	11	7
	Processor	14	63	42	45
	Wholesaler	18	54	66	26
	Retailer	1	0	7	3
	Broker	1	9	8	15

Source: survey data

Further variation occurs when processors or wholesalers buy from each other in order to fill out orders or to pass on excess purchases to balance supplies with market demands. There are even sales from wholesalers to processors for the same reasons. Sales may be arranged through two successive brokers, and this has been common in overseas sales. In export transactions, processors, brokers, and even local wholesalers will deal with brokers and import wholesalers in other countries. It is also becoming increasingly common for large processors to bypass the entire chain and sell directly to large retail food chains, without intervention by other ownership intermediaries.

Finally, for specialized products such as smoked and mild-cured products, there may be separate channels by which salmon are sold directly to smokers, curers, and lox manufacturers by processors, receiving stations, and even fishermen. After processing, these specialized products may move back into the same channel as the more conventional products, or they can move into entirely different channels to reach other markets.

There appear to be two dominant characteristics of the channel: its flexibility and the maintenance of stable business relationships. There are many different ways in which the product can reach the market. A single firm may use several channels either at the same time or in sequence. Definitions of market areas by channel stage show strong overlap as the survey data in table 3-7 suggests.

The stability of the channel is related both to the continued presence of member firms and the enduring relationships between specific pairs of firms. The number of possible arrangements between channel member firms is almost infinite, and linkages appear to be created in response to two factors: the availability of supply and the price. In a sense, the ownership channel may be viewed as a grid pattern of nodes identifying individual firms (see figure 3-3). The actual path through these nodes will be established in response to entrepreneurial perceptions of market opportunities dictated by the supply and prices for both buying and selling.

Table 3-7

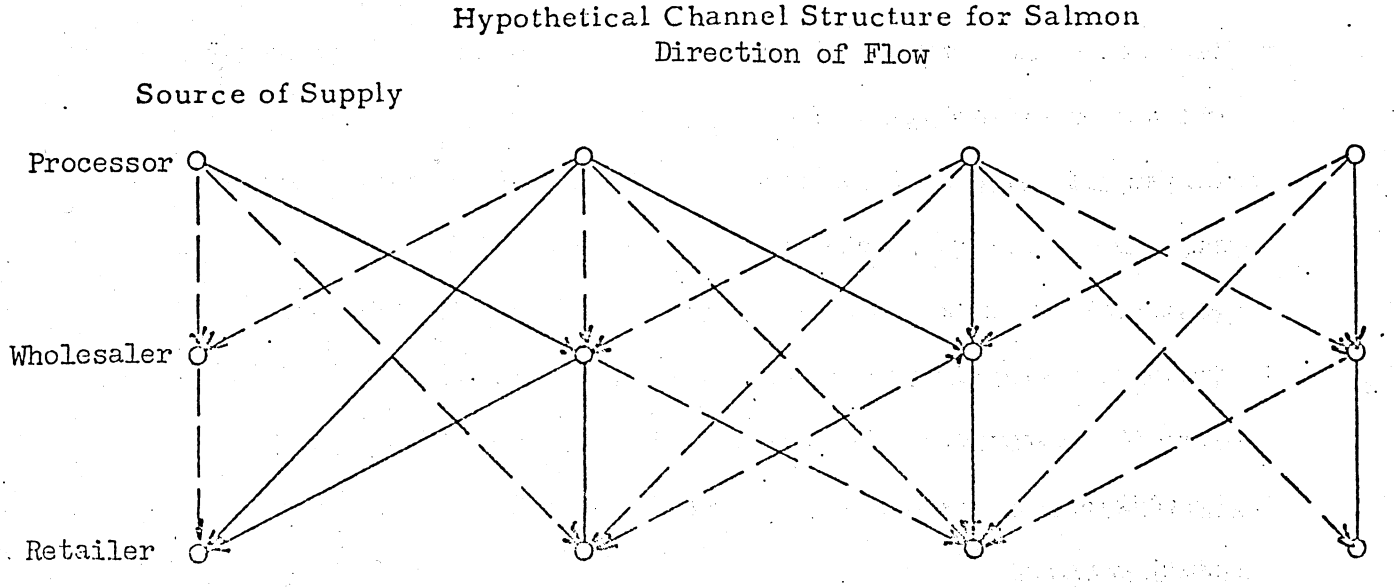
Percentages of Type of Firm and Distribution Area of Responding Firms

Type of Firm	Local	In-State	West	Midwest	East Coast	Export	Total	N
Wholesaler only	25.0	20.8	29.2	8.3	12.5	4.2	100.0	24
Wholesaler-Retailer	22.2	33.3	33.3	5.6	5.6	--	100.0	18
Processor	12.1	3.0	30.3	39.1	18.2	27.2	100.0	33
Processor-Wholesaler	12.3	--	24.6	10.2	28.6	24.6	100.0	49
Broker	8.7	--	13.1	8.7	33.3	30.4	100.0	23
Buyer	66.7	--	--	--	33.3	--	100.0	3
Retailer only	50.0	50.0	--	--	--	--	100.0	6

Source: survey data

Figure 3-3

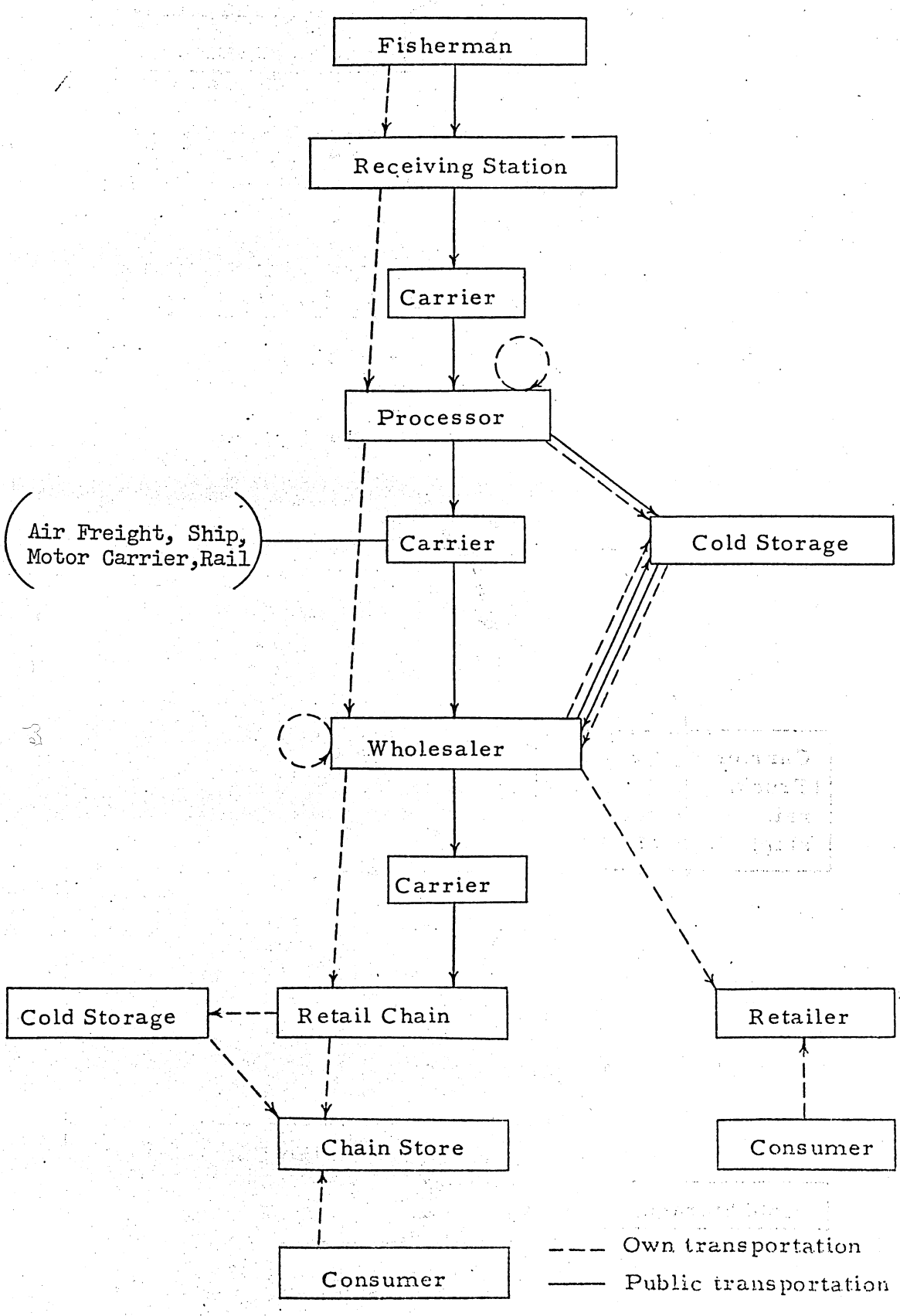
Hypothetical Channel Structure for Salmon
Direction of Flow



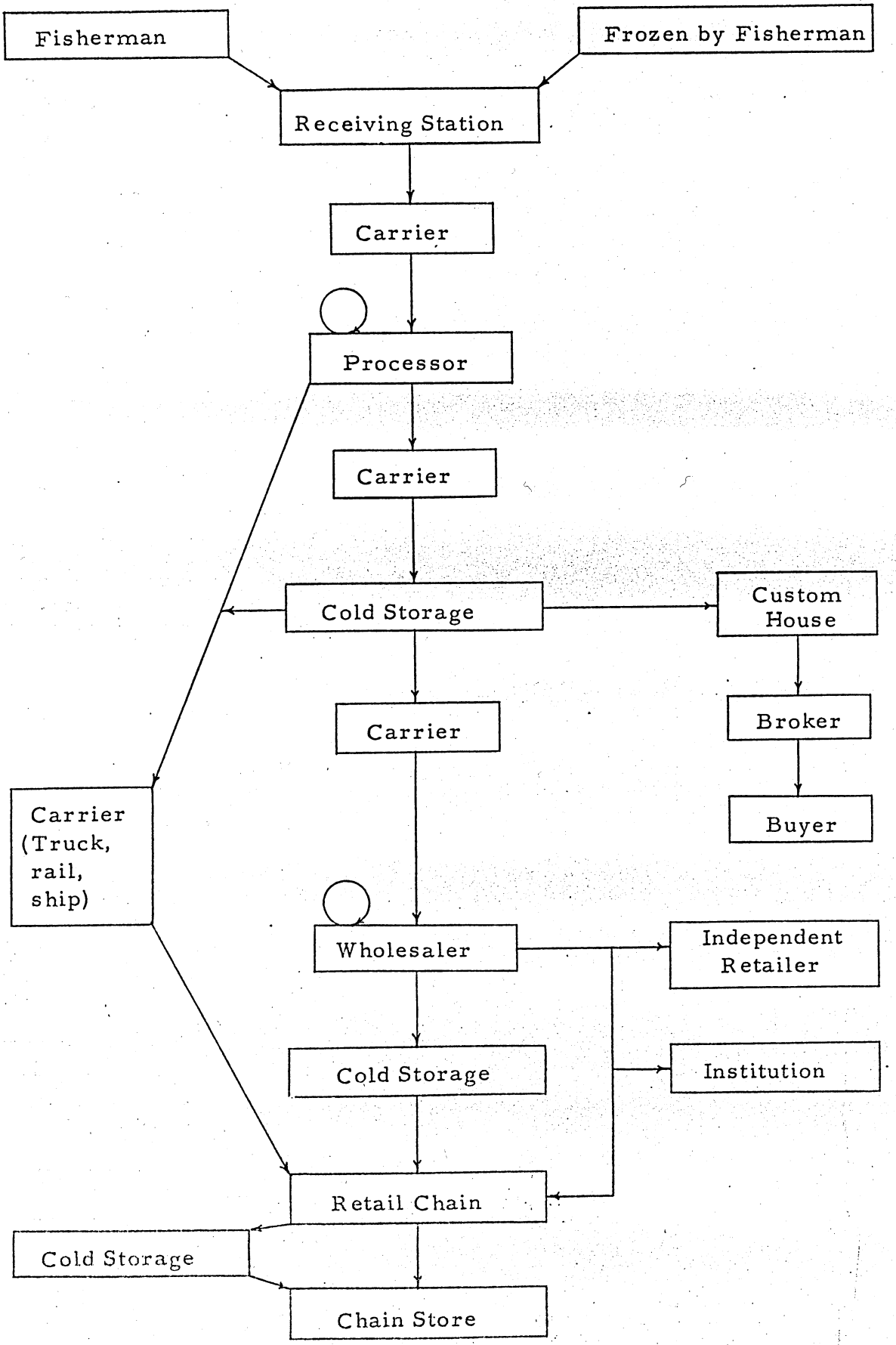
Within this channel, there are stable business relationships which have not changed significantly over long periods of time, maintained by old business tradition, long-established routines, and even family ties. However, even these links exist because they are not significantly less efficient than those established between other firms; and with a few exceptions, even with these ties there are potential changes of allegiance.

The channels for physcial movement of fresh and frozen salmon are shown in figures 3-4 and 3-5. The significant difference between the physical distribution channel and the exchange channel is the interjection of specialist firms to the point that, in several instances, the exchange channel and the physical distribution channel were almost completely separate. There are parallels between the customary physical distribution channel and the exchange channel, flowing from fisherman to receiving station to processor to wholesaler to retailer. In addition there are transportation operations which may be performed by firms operating within the ownership channel or by specialist transportation companies. In inventory holding points within the system, the physical distribution channel for fresh salmon exhibits few characteristics of the multiple paths of the ownership channel. The product simply cannot be handled too many times or delayed more than momentarily. While occasional use of cold storage facilities was reported, this was apparently only to protect stock momentarily.

"Physical Distribution Channel" (Fresh)



"Physical Distribution Channel" (Frozen)



The transformation of the product from fresh to frozen condition permits much more flexibility in movement because the quality of the final product can be controlled more rigorously. Inventories were reported to be held over extended periods up to 1 year. Fish may be acquired, processed, frozen, and even shipped entirely without contact with the ownership channel. Inventories may be held at the source, at the market, or anywhere in between, only incurring costs of holding and periodic reglazing. Therefore, we find inventories being held at processor plants, cold storage plants, wholesalers, and retail chain cold storage plants. The ability to maintain a constant level of quality without deterioration permits the use of different forms of transportation. Where the costs of moving fresh salmon to distant markets may be high, such as air freight charges to Europe and Japan, maintaining the fish in a frozen condition permits the use of lower transportation charges and opens other channels and markets.

The Structure of the Channel

One of the principal factors governing the organization of the channel is the structure, the distribution of enterprises. The salmon distribution channel may be viewed as a series of vertically related markets, in which the presence of market power manifested by buyer or seller concentration would presumably have effects on both preceding and succeeding stages. Because firms operating as

both processing stages and links appear to be characterized by independent ownership, we may hypothesize that salmon is sold in an openly competitive market. The question then arises: are the tests of a competitive market being satisfied, such as the inability of individual firms to influence prices, where resources are free to enter and withdraw as profit levels change, and where buyers and sellers have reasonable information about market conditions on which to make decisions?

Another question with which we must be concerned is the apparent absence of vertical integration in salmon distribution, in contrast to other industries and even other sectors of the food industry. Several reasons can be offered in tentative explanation. Receiving stations and processors are oriented to one geographic area and therefore tend to process all of the species which originate in the area. The only differences in product offering to be mentioned in interviews with firms were the choices of whether to include shellfish as well as finfish as part of the product offering. In the stages of the channel located closer to the final consumer, there was a change in orientation away from local supply specialization toward the variety that the retail customer might prefer, including seafood produced and processed elsewhere: the closer to the final market the broader the selection.

A second reason discouraging vertical integration is the erratic nature of supply. Local catch conditions may be independent of the market-at-large, and the local receiver may encounter conditions of large volume or scarcity. Under complete vertical integration, the buyer would lose either his advantage of flexibility in purchasing or would be forced to buy from other sources, losing the benefits of integration and returning to a nonintegrated channel configuration.

In many lines of food processing there is a tendency toward backward integration. Fish and salmon in particular are a small part of retail chain store requirements and for that reason may not be attractive investments. The only holding in salmon by a food retailer was the A & P canning subsidiary Nakat Packing Company, and this was later sold.

In the remainder of this section we will examine market structure at each succeeding level from the sources toward the market, using published evidence supplemented by survey data. We begin with the fisherman proceeding by stages to receiving stations, processors, brokers, wholesalers, and retailers, in that order.

Fisherman

As the initiating link in the channel of distribution, the number of fishermen would be expected to reflect the economic health of the salmon industry. As we shall note in chapter VI, entry into both gill net- and troll- catching

technologies involves relatively little capital, and therefore the number of fishermen would tend to reflect the anticipated levels of profit in the industry.

Data on the number of fishermen, and in some cases by the type of gear employed, are shown in table 3-8. The intermittent nature of some of the data reported is a result of changes in the published data during this period. In general there has been an increase in every geographic area in the number of fishermen employed. Simultaneously, there also appears to be a shift in the type of gear employed, from the relatively capital-intensive seining methods to more extensive use of troll and gill net technologies. Gill netting, however, has not increased in all areas. In British Columbia, for example, the number of purse and drag seines has remained relatively constant, while the numbers of gill nets and troll lines have shown only modest increases. The low rates of increase in these latter categories may be traced to the strict licensing controls placed over entry into this industry, possibly curbing what would have been a more rapid entry under free market conditions.

In Alaska, the number of seines and gill nets has fluctuated within a fairly constant trend, and the overall growth in the industry has been reflected in a modest increase in troll licenses and growth in the total number of salmon fishermen. The total number of commercial fishing licenses in Washington has also

Table 3-8

Fishing Resources Devoted to Salmon

	British Columbia[1]				Oregon[2]					Washington[2]				
Year	Purse Seines	Drag Seines	Gill Nets	Troll Lines	Commercial Fishing Licenses	Fishing Boats	Gill Nets	Troll	Delivery	Total Licenses	Troll	Gill Net	Purse Seines	Other
1956	499	6	7,014	13,984			675	970			716	1333	211	263
1957	503	8	7,416	14,018			594	943	679	2832	688	1429	421	
1958	518	5	7,562	13,646			693	876	812	3385	1059	1508	447	
1959	516	16	7,436	13,100			699	706	906	3568	1127	1386	428	
1960	509	13	8,022	13,429			668	675	855	3142	1225	1287	341	
1961	500	8	8,010	13,451			646	737	854	3051	972	1294	452	
1962	499	8	9,652	12,732			652	827	948	2907	998	1221	392	
1963	475	9	9,392	13,493			631	856	924	3035	1027	1272	431	
1964	514	10	9,923	14,069	2,899	1,695	444			3056	1280	1216	293	
1965	524	10	10,007	13,893	3,728	1,728	462			3259	1360	1332	400	
1966	511	7	9,843	14,939	3,453	1,872	462			3149	1392	1240	324	
1967	516	9	10,151	15,953	4,553	2,433	570			3601	1635	968	346	

Continued on next page

Table 3-8 Continued

Alaska[2/]

Year	Fishermen Employed	Vessels	Seines	Gill Nets	Trolls	Traps	No. more than 5 tons	Net Tonnage	Launches	Gill Net Boat	Lighters #	Powered Scows (tons)
1956	11,666		1,392	8,072		240	1,971	32,548	3,904	530	86	7,441
1957	10,713		1,397	6,010		205	1,970	31,907	3,583	571	71	6,932
1958	11,214		1,533	5,309		243	1,997	33,359	4,982	240	67	7,158
1959	10,338		1,291	445		"	1,947	30,512	4,230		50	4,679
1960	11,919		1,422	4,158		"	2,256	36,932	4,631		159	
1961	14,010		1,254	5,072		"	1,843	22,635	5,462		110	
1962	16,405	8,157	1,429	5,189	2,049	"						
1963	17,867	8,902	1,436	6,124	2,063	4						
1964	17,211	8,680	1,366	5,813	2,061	4						
1965	17,455	8,811	1,281	5,886	2,341	4						
1966	19,412	9,370	1,276	6,499	2,677	3						
1967	18,172	9,639	1,240	6,375	2,445	4						

Alaska Continued

Year	Unpowered Scows	Skiffs	Other	Personnel Total	Fishermen	Shore	Transport
1956	272		54	22,103	11,666	9,040	1,397
1957	250		54	20,895	10,713	8,955	1,227
1958	232		46	18,573	11,214	6,703	1,092
1959	143		10	16,338	10,339	5,360	639
1960			258	20,630	11,919	7,940	771
1961		680	6	22,121	14,010	7,501	
1962					16,405	6,999	610
1963					17,867	7,907	
1964					17,211		
1965					17,435		
1966					19,412		
1967					18,172		

Sources:

1/ British Columbia: Fishery Statistics of Canada

2/ Oregon, Washington, Alaska: International North Pacific Fisheries Commission Statistical Yearbook.

Note: Missing data not available.

increased. Troll licenses have almost doubled in the period from 1956 to 1967, while seining and gill netting showed no gains at all. This may reflect more than changing technology; it may reflect a shift in fishing activity from Puget Sound and the Columbia River to the Washington coast where only trolling is permitted.

Oregon data appear to show a similar pattern, with increases in total commercial fishing licenses, concomitant with declines in gill-netting. Unfortunately, there are no data on direct participation by fishermen in trolling activity.

In California, trolling is the only legal way in which salmon may be caught. There are no distinct data on salmon fishermen.

The increases which these data indicate are taking place in the number of fishermen are of interest when it is recognized that the size of the catch is relatively constant. The average catch per fisherman would then appear to be declining. From several different sources, the observation has been made that there are increasing numbers of part-time fishermen, either fishing for other species in the remaining seasons or holding jobs ashore and participating only for the summer. Increases in salmon prices, raising the prospects of higher expected values of earnings, coupled with low opportunity costs of either capital or time during the salmon season, along with the pleasures of an attractive part-time occupation, could explain why the increase

is taking place. Entry into the industry appears to be relatively easy, with only limited capital requirements for either gill netting or trolling and readily available financing. However, once the decision to enter has been made, there appears to be a tendency to remain because of the investment and the enjoyment of fishing. The net effect is to increase the total number of fishermen and to reduce the opportunities for individual fishermen to share in the trend to higher aggregate revenues.

There have been several efforts to control prices on the part of fishermen's associations, such as the West Coast Trollers Association and similar groups for California, Alaska, Puget Sound, and the Columbia River. The ease of entry militates against the possibility of any longrun success, as it becomes difficult for any union to control supply under these conditions. According to trade sources, there is an initial price set by processors in Eureka, California, with the California Trollers Association. This price is transmitted northward during the season to become the major input for bargaining by the West Coast Trollers Association and the major processors, principally the New England Fish Company. Because of uncertainties of both demand and more directly of supply, there is a tendency to set lower prices at the beginning of the season. This however may also reflect the weakness of the fishermen's bargaining position vis-a-vis the dominant processor. During the period of the survey, there was a

fishermen's strike which was settled almost immediately through a price concession by the processors. This suggests that processors have a reserve of unused bargaining power. Also, fishermen are faced with a great deal of uncertainty concerning the nature of the market at the beginning of the season.

Receiving Stations

The initial exchange takes place at the receiving stations where fishermen discharge their boats. These are normally shore-based, located at landings, although there are several operations from barges and tenders receiving from seining and gill-net operations. Because of the erratic nature of the fishery, both in volume of catch and its location, we would expect to see both low concentrations of buying activity and changes in rank orders of volume, except in consistently advantageous positions such as the mouth of the Columbia River.

Data on fish landings by dealer are normally collected for tax purposes by each State. For this study, data were secured for California and Oregon and are shown in summary form in table 3-9. The California data are available for two successive years, 1967 and 1968. Unfortunately, in order to avoid disclosure of individual firms there was no indication whether the dealers who were ranked in order in 1967 maintained the same order in 1968. Because of the limited number of salmon receiving stations

of any size in California, the rank orders in this case would be presumed to maintain about the same order.

Table 3-9

Concentration of Purchases of Salmon from Fishermen by Dealers
(percent of total pounds)

	California Data				Oregon Data
	1967		1968		1968
	Salmon	All Fish	Salmon	All Fish	Salmon
Four largest	31.8	11.7	25.2	12.4	45.9
Eight largest	49.4	18.9	39.6	21.4	71.2
Twenty largest	81.2	38.5	68.5	41.0	94.7
Other dealers	18.8	61.5	31.5	56.8	6.3
	100.0%	100.0%	100.0%	100.0%	100.0%
Other dealers (No.)	78		71		30

Source: California Special Tabulation. California Department of Fish and Game, Marine Resources Operation, Biostatistics, Terminal Island, California

Oregon: Tabulation from Oregon Tax Records, Oregon Fish Commission, Portland

Most of these receiving stations are owned or controlled by processors. The Oregon data however show more concentration than the California data, which may stem from geographic location. The California data, are of interest for another reason; there is no correlation between concentration of purchases in salmon and purchases of all species, indicating a specialization by species among these dealers.

These data do not provide a precise description of market control. While there is some direct ownership, it appears to be stronger in the case of Alaska than for the other states. The risks of ownership because of the catch characteristics would appear to place a limit on backward integration by the processors. However, even this is uncertain because of hidden ownership relations which exist. There are other forms of control such as agency and informal buying arrangements, many of long standing, which will achieve the same purpose without the risks of ownership.

Processors

From receiving stations, fish are moved to processing plants where they are dressed, possibly cleaned, and then prepared in fresh, frozen, and mild-cured product forms for sale to the market. Processors would appear to be pivotal in organizing the supply for the salmon market. They are larger than individual receiving stations, and if they do freezing in their own plants, they may have considerable economies of scale. Therefore we would expect to find less processing plants than receiving stations.

The only data available on relative shares of production volume among processors measure freezing activity and mild-curing and exclude fresh volume. As the bulk of salmon are sold in fresh and frozen form, the volume of freezing activity, reported in the

annual issues of the National Fisherman, appears to be the most indicative measure of concentration available. Some of the smaller processors, however, who sell only fresh product and for whom there are only impressionistic data available from interviews, are necessarily excluded.

The basic annual data on freezing volume for individual firms are shown in table 3-10, grouped in percentages of total regional output and covering the period 1956-1968. Where firms have been merged, the data are shown as reported. A more indicative presentation is table 3-11 which takes the same data but shows the firms grouped in rank order.

In British Columbia production is almost completely in the hands of two firms. The dominant firm is British Columbia Packers, which increased its share of provincial freezing volume from 35.3 percent in 1956 to 52.5 percent in 1968. The Puget Sound is almost equally concentrated with 77.8 percent of freezing volume produced by four firms. The New England Fish Company, including its acquisitions of recent years (Whiz-Eardley and San Juan Fish Company), is the dominant producer by far in that market, followed by McCallum-Legaz and Whitney Fidalgo. The lowest degree of concentration in local markets is shown for Alaska, where the four largest firms have only slightly more than 50 percent of the market. However much of the Alaska freezing volume is controlled by firms located in Seattle, so that market control is understated unless these ownerships are taken into account.

Table 3-10

Concentration in Frozen Salmon Production

(percent of total freezing volume in pounds)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Alaska													
Booth	4.7	6.3	6.9	3.2	3.7	1.5	12.5	4.1	1.8	1.7	1.4	3.2	--
Halibut	11.1	15.1	19.1	23.6	30.9	22.2	28.4	41.1	37.8	61.0	24.6	16.5	7.9
Kaylor-Dahl	5.8	2.8	4.9	3.5	4.2	1.3	1.1	1.3	1.1	--	1.3	5.3	2.7
McCallum-Leaaz	1.0	1.6	--	.8	.5	2.2	2.4	5.6	9.1	10.6	--	.8	3.3
E. C. Phillips	2.8	2.9	5.5	.5	9.1	20.5	17.1	10.3	18.4	--	23.4	--	17.3
San Juan	2.7	1.4	.8	6.5	1.4	9.7	--	--	-	.5	1.0	--	--
Other	71.9	69.8	62.8	57.5	50.1	42.7	38.5	37.7	31.8	26.3	49.6	74.2	68.8
Total (%)	100.0	100.0											
TOTAL (000 lbs)	8,603	6,891	5,879	6,298	6,053	7,160	8,795	8,236	13,164	7,634	14,631	9,727	17,492
British Columbia													
B. C. Packers	35.3	31.7	34.6	37.7	43.0	25.4	36.9	38.3	35.4	44.9	44.9	54.5	52.5
Booth	1.9	1.9	2.8	1.1	1.7	.8	--	1.1	3.0	2.7	3.5	2.3	4.3
Canadian Fishing Co.	20.0	31.5	34.7	37.1	30.7	20.8	26.8	24.1	29.0	22.4	20.9	11.8	14.7
Prince Rupert	18.3	--	--	--	--	51.1	--	--	23.0	--	30.6	27.3	16.3
San Juan	2.4	5.1	7.2	2.7	3.5	1.9	3.7	1.2	.7	.7	--	--	--
Other	22.0	29.8	20.7	21.4	21.1	--	32.6	35.2	8.9	29.2	--	4.1	12.2
Total ( )													
TOTAL (000 lbs)	15,891	8,358	15,598	9,314	11,048	13,900	13,950	15,634	18,201	14,572	18,533	15,777	20,767
Puget Sound													
Booth	12.7	17.4	13.3	14.6	12.3	16.3	--	8.7	7.3	15.2	9.0	8.0	7.4
Everett	--	2.1	1.9	3.6	2.9	3.1	4.3	2.2	7.1	5.5	5.5	2.5	6.7
McCallum	1.5	5.1	5.8	5.0	--	5.3	5.9	9.2	9.8	15.7	16.4	34.5	24.1
New England	5.8	1.8	4.1	4.4	2.6	2.8	2.6	6.5	6.0	2.1	--	--	13.4
San Juan	25.8	29.1	21.4	14.6	10.5	16.1	10.1	20.7	14.1	22.5	14.6	6.9	--
Seaport	--	6.8	15.5	6.4	13.0	14.0	--	--	--	23.5	16.1	5.2	20.0
Vita	13.4	--	--	--	--	--	--	--	--	--	13.3	28.9	20.0
Wash. Fish & Oyster	15.3	17.4	20.3	22.4	16.2	10.0	10.3	9.7	11.7	8.4	10.4	--	8.0
Whiz	5.9	--	--	29.1	.9	10.7	17.5	9.2	7.3	--	11.6	8.9	--
Other	19.7	20.4	17.8	--	41.7	21.7	50.6	33.8	36.8	7.1	3.3	5.1	.5
Total (%)													
TOTAL (000 lbs)	6,747	3,714	4,830	3,431	3,195	3,750	4,926	5,431	6,885	5,661	8,910	8,517	6,994

Continued on next page

Table 3-10 Continued

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Oregon													
Bumblebee	24.8	53.3	--	--	12.1	49.2	66.2	68.5	78.4	82.6	47.6	76.9	52.1
Portland Fish	23.6	--	--	--	19.2	24.8	--	15.7	18.7	17.4	11.9	23.1	47.9
Other	51.6	46.7	100.0	100.0	68.7	26.0	33.8	15.8	2.8	--	10.4	--	--
Total (%)													
TOTAL (000 lbs)	1,791	793	558	59	687	866	630	829	1,270	1,724	2,530	1,952	1,043
California													
Lazio	25.8	46.7	15.4	14.3	100.0	--	100.0	--	--	--	--	--	--
Meredith	--	--	--	--	--	--	--	28.7	69.6	--	100.0	55.5	--
Other	74.2	53.7	84.6	85.7	--	100.0	--	71.3	30.4	100.0	--	46.4	--
TOTAL (000 lbs)	1,263	270	201	182	600	444	1,000	1.743	718	843	1,500	1,172	--

Source: National Fisherman, annual issues.

Table 3-11

Concentration in Frozen Salmon Production

(percent of freezing volume in pounds)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Alaska													
4 largest companies	43.8	39.7	40.0	53.5	47.9	54.5	71.4	66.6	75.7	86.7	63.3	45.7	50.6
8 largest	75.2	51.1	50.0	70.5	54.2	100.0	80.9	78.5	93.4	97.4	76.0	57.7	72.7
20 largest	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0		100.0			96.8
Total co.'s reporting	19	10	11	10	8	7	10	12	11	13	12	10	28
Puget Sound													
4 largest	67.1	74.6	70.4	80.8	51.9	57.1	42.4	48.8	42.9	76.9	60.3	80.3	77.4
8 largest	91.4	96.9	87.8	100.0	63.0	78.3		70.4	64.7	99.9	96.7	98.2	99.8
20 largest		100.0		100.0						100.0	100.0	100.0	100.0
Total co.'s reporting	12	10	9	8	8	8	7	9	8	9	12	10	9
British Columbia													
4 largest	95.6	98.1	97.2	98.9	98.3	99.2	97.9	98.7	97.7	98.9	100.0	97.7	90.3
8 largest	100.0	100.0	100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0	100.0
Total co.'s reporting	6	5	5	5	5	5	4	5	7	5	4	5	6

Source: 1957-67 Pacific Fishermen Yearbook.
1968 National Fisherman Yearbook.
1964 National Fisherman Yearbook.

The California and Oregon shares are even more concentrated because there are fewer firms taking major positions in the frozen salmon markets. In Oregon, Bumblebee and Portland Fish Company dominate the market almost entirely. In California, Meredith Fish Company and Tom Lazio have been the dominant firms in salmon freezing.

The interesting characteristic of these shares is their instability over time. While the same firms dominate the markets over the entire period, their market shares vary, indicating the fluctuating volume and location of the catch. The structure of the combined frozen salmon processors' market, including the four States and British Columbia, would appear to show a low degree of market concentration, as shown in table 3-12. The largest single firm in this market has never exceeded 23.5 percent of the market, and the 15 firms which dominate the market only accounted for 63.7 percent of the market in 1968, although their shares were higher in earlier years.

The data are misleading, however; not only do they fail to include activities of fresh fish processors and possible small freezers, but they cannot reflect some of the buying activities of large organizations. As an example, one major producer with a reported volume of freezings in excess of 1 million pounds reported purchases from other processors of between 7 and 10 million pounds a year.

Table 3-12

Volume of Freezings in U.S.-Canadian Pacific Frozen Salmon Industry by Major Firms

(thousand pounds of major firms)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Booth	1,563	1,240	1,474	806	809	830	1,100	994	1,284	1,388	1,650	1,358	1,412
B. C. Packers	5,612	2,647	5,397	3,511	4,752	3,531	5,142	5,990	6,436	6,542	8,349	8,593	10,895
Bumblebee	445	423	--	--	83	426	417	568	996	1,424	1,206	1,502	543
Canadian	3,184	2,631	5,418	3,452	3,397	2,897	3,745	3,769	5,284	3,213	3,865	1,857	3,063
Everett		78	92	122	92	116	214	118	488	312	486	215	470
Halibut	1,153	1,406	1,121	1,484	1,870	1,386	2,500	4,004	4,982	4,687	3,600	1,603	1,382
Kaylor-Dahl	500	196	291	220	256	92	96	103	146	--	197	519	471
Lazio	326	126	31	26	600	--	1,000	--	--	--	--	--	--
McCallum	190	300	280	220	30	355	500	959	2,175	1,705	1,406	3,010	2,260
Meredith	--	--	--	--	--	--	--	500	500	--	1,500	650	--
New England	1,315	615	780	500	307	241	402	578	845	284	--	--	1,436
Eardley	350	400	270	--	--	--	--	--	--	--	--	--	--
Whiz	1,155	280	150	1,000	30	400	800	500	500	--	1,030	761	--
San Juan	2,965	1,609	2,209	1,164	1,198	1,784	1,153	1,312	1,099	1,417	2,360	587	--
Phillips	240	200	325	310	550	1,465	1,500	845	2,420	--	3,430	--	3,030
Prince Rupert	2,901	--	--	--	--	7,100	--	--	4,184	--	5,670	4,315	3,382
Portland Fish	422	--	--	--	132	215	--	130	238	300	301	450	500
Washington Fish	1,090	675	995	770	617	375	630	618	806	475	924	--	660
TOTAL	23,411	12,826	18,833	13,585	14,723	21,413	19,199	20,988	32,383	21,747	35,974	25,420	29,504
GRAND TOTAL All Firms	34,295	20,025	27,067	19,285	21,583	26,120	29,301	31,874	40,237	30,424	46,105	37,146	46,297

Continued on next page

Table 3-12 Continued

	Percent of Total Freezings by Major Firms												
	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Booth	4.6	6.2	5.4	4.2	3.7	3.2	3.8	3.1	3.2	4.6	3.6	3.7	3.0
B. C. Packers	16.4	13.2	19.9	18.2	22.0	13.5	17.5	18.8	16.0	21.5	18.1	23.1	23.5
Bumblebee	1.3	2.1	--	--	.4	1.6	1.4	1.8	2.5	4.7	2.6	4.0	1.2
Canadian	9.3	13.1	20.0	17.9	15.7	11.1	12.8	11.8	13.1	10.7	8.4	5.0	6.6
Everett		.4	.3	.6	.4	.4	.7	.4	1.2	1.0	1.1	.6	1.0
Halibut	3.4	7.0	4.1	7.7	8.7	6.1	8.5	12.6	12.4	15.4	7.8	4.3	3.0
Kaylor-Dahl	1.5	1.0	1.1	1.1	1.2	.4	.3	.3	.4	--	.4	1.4	1.0
Lazio	1.0	.6	.1	.1	2.8	--	3.4	--	--	--	--	--	--
McCallum	.6	1.5	1.0	1.1	.1	1.4	1.7	3.0	5.4	5.6	3.0	8.1	4.9
Meredith			--	--	--	--	--	1.6	1.2	--	3.3	1.7	--
New England	3.8	3.1	2.9	2.6	1.4	.9	1.4	1.8	2.1	.9	--	--	3.1
Eardley	1.0	2.0	1.0	--	--	--	--	--	--	--	--	--	--
Whiz	3.4	1.4	.6	5.2	.1	1.5	2.7	1.6	1.2	--	2.2	2.0	--
San Juan	8.6	8.0	8.2	6.0	5.6	6.8	4.0	4.1	2.7	4.7	5.1	1.6	--
Phillips	.7	1.0	1.2	1.6	2.5	5.6	5.1	2.7	6.0	--	7.4	--	6.5
Prince Rupert	8.5	--	--	--	--	27.2	--	--	10.4	--	12.3	11.6	7.3
Portland Fish	1.2	--	--	--	.6	.8	--	.4	.6	1.0	.7	1.2	1.2
Washington Fish	3.2	3.4	3.7	4.0	2.9	1.4	2.2	1.9	2.0	1.6	2.0	--	1.4
TOTAL	68.2	64.0	69.6	70.4	68.2	82.0	65.5	65.8	80.5	71.5	78.0	68.4	63.7
GRAND TOTAL	34,295	20,025	27,067	19,285	21,583	26,120	29,301	31,874	40,237	30,424	46,105	37,146	46,297

Source: National Fisherman, annual issues.

It is thus impossible to measure precisely from the data of this study how far the concentration of buying power has gone at the processor level. On the strength of the published data, it would probably be safe to say that it is unlikely a single firm can dominate the selling market for frozen salmon. However, if the actual concentration in selling is as severely understated as indications suggest, then there may be some social problems in the exercise of market power. Even from the published data the differences in concentration suggest that there may be considerable power exercised in the buying market from receiving stations.

One source of concentration has been, as we noted before, the economies of scale in freezing operations. However this does not explain the tendency to purchase on large scale for resale. Where the product is essentially undifferentiated, there may be little power to offer in the market against the buying power of large resellers, other than the ability to supply the requirements of large retail chains. This would appear to be one reason why processors are concerned about securing large supplies to reduce inequalities of bargaining positions; i.e., by offering buying officers of large resellers the advantages of supplying their total requirement.

The Intermediate Market Structure

One path of fresh and frozen salmon to market, along with other seafoods, is through the intermediate market structure which includes both brokers and local wholesalers. The primary function of the wholesaler is to serve local markets, although as we noted earlier,

some are involved in selling to other buyers in distant markets as well. The wholesaler appears to fill the role of buying agent for retailers and institutions such as restaurants, hotels, and clubs.

Wholesalers have declined in importance because in some market areas the major retail chains have turned to direct purchases from the processors, while the client stores with which they have retained the traditional wholesaling relationships have tended to decline. This trend has not been as pronounced on the West Coast; the chain stores with which we had contact relied on wholesalers for fresh salmon product, though less so for frozen. Profitability has declined for most of the wholesalers in the survey, and this would be expected to be true elsewhere in the United States, as the evidence in table 3-13 suggests.

Table 3-13

Comparison of Seafood Wholesale Structure, 1958-1963

	Number of Firms		Sales $(000)		Payroll $(000)	
	1958	1963	1958	1963	1958	1963
All Seafood Wholesalers	1,701	1,673	$758,833	$785,448	$45,372	$56,531
Merchant Wholesalers	1,612	1,602	631,237	692,888	43,063	54,232
Brokers	89	71	127,596	92,610	2,309	2,199

Source: Census of Business, 1963

The traditional role of the merchant wholesaler has included delivery, inventory, financing for normal credit terms, and order

processing. The statistics may include firms which are also classified as processors, as many processors combine the functions of processing and local distribution. Wholesalers in the survey for the most part were reluctant to disclose much of their operations and cost data. Their general feeling was that there was little to distinguish one firm from another except for service offerings. They could only compete effectively by high levels of service. One firm mentioned delivering to a retail store as often as six times per day. Another described an ordering procedure which had been developed in cooperation with a local supermarket chain, where the wholesaler and the chain buyer established the items to be ordered and the wholesaler then called each store in turn to take the orders from the individual store managers. Whether such tactics will be successful in the long run will depend not only on the wholesaler's own position but those of his client stores and the products that he sells. The wholesaler is a distributor of fresh fish more than of frozen, and he sells more to small stores and chains than to large ones. Changes in the retail market structure will affect his markets substantially.

The local wholesaler is under pressure both from his changing market and his costs of business. Sales of seafood products amounted to 0.1 percent of total commodity sales by wholesale grocers in 1963, but seafood wholesalers appear to operate with higher costs than other food wholesalers. Comparisons of resource productivity in food wholesaling can be seen in table 3-14.

Table 3-14

Comparative Wholesale Productivity

Sales and Inventory per Square Foot of Warehouse Space

	Sales	Inventory
Groceries and related products	$123.75	$6.45
General line groceries total	132.84	8.77
Fish, seafood	107.64	5.02
Meat and meat products	230.86	4.82

Sales per Sales Employee and Sales Employees as Percent of Total Employment

	Sales	Sales/Employees
Groceries and related products	$489,648	20.2%
General line groceries	880,304	16.0
Seafood	322,662	15.9
Meat, meat products	628,662	16.8

Source: Business and Defense Services Administration, Facts About Grocery Wholesaling (Washington, D.C., Government Printing Office, 1968).

From this table it can be seen that of all of the food wholesaling categories, seafood is least productive in both sales per sales employee and sales per square foot of space. Unless margins are substantially higher than in other lines, wholesaling activity can be expected to decline further. It can be argued that these ratios are already the result of inefficiencies stemming from the use of obsolete plants. However, under the present conditions, construction of new plants does not appear attractive. Part of the higher cost may be argued on a basis of the specialized nature of seafood products, since they require handling substantially different from that of other food products. The evidence lies in the lack of integration

with other forms of wholesaling activities. However, these comparatively high costs are reflected in food prices in the supermarket, and consumers who purchase protein foods on a basis of price may shift to other sources of supply. This may also encourage a search for more efficient ways of distribution, as the expansion of direct purchases by large chains from the buyers has already indicated.

Brokers, as the data in table 3-13 show, have also declined in number. The function which identifies brokerage as a separate activity is the bringing together of buyers and sellers, in return for a percentage commission, which is quoted as about 5 percent of sales. Brokers occasionally will take speculative positions in inventory, and one broker indicated that this was the only way that he could earn satisfactory profits. Brokers tend to serve local markets, i.e., local wholesalers and retailers rather than suppliers. The exceptions to this have been Alaska and exports to Europe, where supplier-oriented brokers have performed necessary services in linking remotely located supplies to markets.

The decline in the number of brokers is more pronounced than that of wholesalers. During the course of the survey, the impression was conveyed that the market is becoming increasingly supply-oriented, and that buyers are actively seeking new sources of supply, bypassing local brokers entirely. Even the presence of European buyers was reported to be commonplace in such major supply centers as Seattle. Several processors also commented that

they have absorbed the brokerage function and are actively searching out the market. Marketing literature has frequently referred to the presence of middlemen as evidence that the cost of contact is reduced by their presence.[12] However, the reductions in the numbers of firms on both sides of the transaction and increased use of WATS telephone and teletype service have removed this advantage of brokerage because of the reduced costs of contact.

Retailing

The structure of retail marketing of seafood is parallel to that of retailing in general, of dominance by large chains and the decline of specialty food shops such as butcher shops and seafood stores. Seafood stores sell an almost insignificant part of total retail food volume as these data indicate:

Total Retail Sales by Type of Establishment

	($1,000)
Food stores, total	$53,044,881
Meat stores	1,314,146
Seafood stores	141,868

Source: Census of Business, 1963

The seafood store has characteristically offered a wide assortment of seafoods. In recent years, the variety of seafoods offered has been its one advantage in competition with the chain stores. Because seafood stores are in decline, there is a concern for where highly valued seafood products will be marketed. While it may be

[12] Helmy H. Baligh and Leon E. Richartz, Vertical Marketing Structures, Boston: Allyn & Bacon, 1967, chapter 2.

logical for selected supermarkets to take over some of this function of offering variety, this would appear to be done on the basis of individual stores rather than on a chain-wide basis. Outside of the Pacific Northwest, salmon appears to be regarded as a specialty item, with a more limited market acceptance than seafood in general. As the number of independent seafood stores declines, it may be difficult to find outlets to handle salmon for the retail trade.

Retail buying power is becoming more concentrated in the large retail food chains. All data indicate clearly that there has been an exodus of small food merchants. From 1948 to 1963, the time of the last published Census of Business, the total number of food stores declined from about 350,000 to 219,000 stores, the decline occurring almost entirely within single store firms. During the same period, firms with sales of 1 million dollars or more increased their share of total retail food sales from 11.9 to 52.9 percent of the total, and sales by chains of 50 stores or more increased their share from 28.9 to 39.7 percent. Local market concentration is more relevant for measuring retail competition than any national market measure. A Federal Trade Commission study[13] found that four retailers in each of 15 major metropolitan areas accounted for a mean combined share of 63 percent of total retail sales.

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13 Federal Trade Commission, Economic Report on the Structure and Competitive Behavior of Food Retailing (Washington, D.C., Government Printing Office, 1966), p. 19.

The combination movement in food retailing either through direct ownership, cooperative or voluntary affiliation, has led to a high level of buyer concentration. As the FTC study noted:

> ...although there were still 218,615 grocery store companies in 1963, fewer than 100 buying organizations, composed of the largest corporate chains, chain buying groups and voluntary and cooperative groups of affiliated independent retailers, purchased most grocery store products. Their share of total purchases of various food store products ranged from a lower limit of 55 percent to an upper limit exceeding 90 percent. These estimates relate solely to products purchased in national markets, where every retailer is a potential customer of food manufacturers. Needless to say, buyer concentration is much greater in the purchase and sale of products in essentially local or regional markets.[14]

For the purpose of this channel survey it was impossible to do more than take a localized sample of chain store practice on the West Coast, recognizing that practices may vary substantially in different areas of the country. Only one chain was sufficiently large to distribute to its stores directly, and even here its metropolitan area requirements in the Pacific Northwest were satisfied through local wholesaling operations. In general, and particularly in the Northwest, it appeared that there was a matching of wholesalers to individual store chains so that instead of bypassing the local wholesaler, the practice was to use his services, particularly for fresh products. Several chains did buy directly from large processors, but this was primarily for frozen products distributed to national or eastern markets.

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[14] FTC (1966), p. 39.

Because of the specialized nature of many seafood products and their specific appeal to narrowly defined markets, these general measures of salmon distribution might tend to overstate the case with distribution of fresh and frozen salmon. However, it is important to recognize that buyer concentration at the retail level appears to be stronger than seller concentration at the processor level, and the principal factor which mitigates this for the processor is the presence of large overseas markets.

Vertical Integration

In many food product markets there has been vertical integration backwards towards the source of supply. This has been particularly prominent in the largest chains. While there has been some acquisition of fish processors by food conglomerates, such as the ownership of Booth Fisheries by Consolidated Foods and Bumble Bee by Castle and Cook, there has been no integration backward into salmon distribution since A & P sold Nakat Packing Company to New England Fish Company in 1968.

Several reasons may be offered. One of course is that salmon and even seafood represent such small shares of total sales that the chains have not seen any advantage in backward integration. There may, however, be an even stronger reason. Vertical integration in food has been selectively applied. As Professor Richard Heflebower has suggested, the failure by large retailers to integrate into a product area was "prima facie evidence that the supplying industry is competitive and efficient, unless the product

was unimportant, or consumers are so strongly wedded to established brands that a large volume cannot be sold advantageously under a distributor brand."[15] In salmon, the second condition is met, the third is not. It has not been possible for a processor to establish a brand preference of any significance for salmon, so far as is known, and retailer brand preference might not be any stronger. However, part of the reason may also lie in the earnings of salmon processors and whether they would be sufficiently attractive to encourage a takeover.

In the absence of these incentives, we may conclude that the industry either earns only average returns or less, that its contribution to American food retailing is sufficiently small, and that it has remained independent of retailers. Whether it is competitive, we will test by first examining price behavior in the final section of this chapter and then by rates of return, in chapter VI.

III. Price Making in the Distribution Channel

In a commodity market where products are almost undifferentiated by producing firms, there are two ways by which one firm can compete with another in offerings to the buyer: first by the quality and quantity of offering, which we have seen has led to large-scale buying practice by processors in order to assure large buyers of

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[15] Richard B. Heflebower, "Mass Distribution: A Phase of Bilateral Oligopoly of Competition," American Economic Review (May 1957), p. 181, quoted in Federal Trade Commission, op. cit., p. 68.

sufficient quantity; and second, by the price offering. The test of the competitive nature of this market, therefore, depends on the price rivalry which is exhibited at each stage of the distribution channel. Prices are made at several levels in the channel: the landing stage, between fishermen and receiver, between receiver and processor, between processor and wholesaler, between wholesaler and retailer, and finally, between retailer and consumer.

Pricing at the landing stage, as we have noted earlier, has some elements of collective bargaining, but the power of the fisherman is limited by the ease of entry into the market. On the other hand, the processor must pay enough to maintain a supply, so that the reservation price of the fisherman becomes a counterweight to the potential power of the processor.

Receiving stations, because of their close ties to the processors, appear to price their services on a basis of predetermined "add-on" charge, expressed in cents per pound. While there may be some room for bargaining between independent firms, it does not appear to be widely exercised. One processor-wholesaler commented that he has a floor price at which he will offer to buy quantities up to the entire output of the receiving station, and the receiver will sell to him if he cannot find a buyer at a higher price. How useful a floor price such as this will be in securing supplies could not be determined, because it would depend essentially on the difference between the floor and the current market price. Profitability will depend on whether the spread between the buying price

in the receiving market and the selling price after processing is sufficient to permit a profit after all costs and taxes. It is in this stage where the interplay of supply and demand is strongest. The processing firms appear to dominate pricing up to this point. Beyond this point, offering prices must reflect demands in the final market.

That this is so is supported by comments made by both wholesale and retail firms regarding pricing practices. These firms are principally concerned in their buying practices with the maintenance of margins and will buy only where they feel confident that their costs plus margins will be accepted by the market. The criteria for margins will vary with the season and alternative species. The selling price is often subject to negotiation, reflecting quantities available as well as willingness to pass on prices to customers. Margins are not fixed as rigid percentages, but as figures with some room for adjustment to specific market circumstances.

The ultimate concern in retail markets, of course, is the consumer. From two different retail buyers, the comment was expressed that they would hesitate to offer salmon at more than $1.00 per pound (in 1969 prices), although one store chain did offer higher quality salmon in the early season at $1.19 per pound. It is not certain whether the barrier exists in the mind of the consumer or in the perception of the consumer by the buyer.

Data on pricing behavior over a considerable period of time are available for only a few points in the channel. Landing prices

are reported by the Market News Service on a daily basis for Seattle and various Alaskan points for salmon by species in dressed condition. Prices are also reported for the New York City and Chicago wholesale markets for fresh and frozen fish. The price "spread" between the supplying markets and the wholesaler market would indicate not only demand conditions but also the costs of distribution up to that point in the channel. As costs of processing and distribution increase over time, we would expect the margins to increase, in cash differentials certainly, but in percentage terms also, as an increase in the minimum price of the fish. One hypothesis to explain market behavior is that if margins increase over time the markets are not equally balanced; either suppliers or buyers are able to exert market power to remove bargaining power from the other side. Alternately, this could also indicate rising costs without a shift in profit between stages. If, however, there is fluctuation in prices, this would be more apt to reflect a competitive market in that profit capture by either stage is only transitory.

The landed price for each species will vary not only for the species, but also for quality, the manner in which it is caught (whether by trolling or other means), size, and location. For example, data on the volume and revenue of differing species by region yielded the array of prices shown in table 3-15.

It is not possible to separate geographic from nongeographic influences on price differences. Therefore this information by itself is of limited application to the problem of understanding

channel pricing, aside from the emphasis it provides on the existence of these differences. For example, chinook salmon from California and Oregon were entirely trolled caught, and because they entered the same market, were sold at identical prices. There is a small difference in prices for coho between these regions, which may reflect the lower prices that start the season. Columbia River salmon prices reflect a mixture of gillnet and trolled salmon, and prices would hence differ because of the mixture when compared to prices on the Pacific coast and between the States on the Columbia River. Other Washington prices include both coastal troll-caught salmon and Puget Sound seining and gillnet operations. The Alaska price is low because of both the nature of the catch and the geographic remoteness of the area, and part of the difference is transportation cost.

Price data available for this study are shown in table 3-15 for the period 1956 through 1968 for representative classes: large red chinook, large coho, and medium red chinook. The data are taken from Market News Service monthly bulletins from Seattle, New York and Chicago. The patterns which emerge are fairly obvious, in that there is an upward trend in price behavior in the past few years which has been attributed by industry people to increasing demands by European markets. The price behavior at the source shows a typical pattern of beginning low and increasing toward the end, although the erratic nature of the fishery adds some distortion to the pattern. Data in table 3-15 were taken from the same sources

Table 3-15

Price Behavior in Differing Geographic Markets

	Price Levels (¢/lb, dressed) July of each year												
	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Large Red Chinook													
Seattle	56-61	48-58	73-89	63-69	69-77	70.5-73	80-94	80	80-83	73	71	78	86
New York	60-68	-	80 (fzn)	70-85	-	90	98	89	70-107	68(fzn)	76-78	73-1.10	80-120
	Index of Prices Based on Median Seattle Price, July of each Year												
Med. Seattle	58.5	53	81	66	73	71.75	87	80	81.5	73	71	78	86
Index: Seattle	91-109	91-109	90-110	96-105	95-106	98-102	92-108	100	98-102	100	100	100	100
Index: N. Y.	107-121	-	99	106-129	123	126	112	111	86-131	93	107-110	94-140	93-140
Medium Red Chinook				Price Level									
Seattle	41-53	36-39	46-54	46-48	56-63	56	56-58	55-56	55-62	60	55-56	63	71
Juneau	-	32	38	29-30	32	32-35	40	40	35	40-45	35	37-40	40-45
N. Y.	58-65			67-75									
N. Y. fzn			70	60-65			83-85	70-75	72-73	72-73	75-78		
Chicago	-	45	60-65	44	76	-	74-75	70	72	70-72	72-75	85	-
	Index of Prices Based on Median Seattle Price												
Med.Seattle	47	37.5	50	47	59.5	56	57	55.5	58.5	60	55.5	63	71
Index: Seattle	87-113	99-104	92-108	98-102	94-106	57-63	98-102	99-101	94-106	100	99-101	100	100
Juneau	-	88	76	62-64	54	-	70	72	60	67-75	63	60-63	56-63
N. Y.	123-139	-	-	143-159	-	-	-	-	-	-	-	-	-
N. Y. fzn	-	-	140	128-138	128	-	-	126-135	123-125	120-122	135-140	-	-
Chicago	-	123	120-130	94	-	-	132-134	126	123	117-120	130-135	135	-
Large Coho				Price Level									
Seattle	34-39	30-31	34-39	34-36.5	46-49	36-39	37.5-41.5	36.5-38	43-45	43	40-41	48-51	54
Juneau	-	-	20-27	20-23	23-30	36-37	20-25	17-27	25-31	22-32	25-34	27-38	35-41
Chicago	-	40-45	53-55	48-50	65-70	55	57-60	54-57	60	55-58	64-65	72-75	80
				Index									
Med.Seattle	36.5	30.5	36.5	35.25	47.5	37.5	39	37.25	44	43	40.5	49.5	54
Index: Seattle	93-107	98-102	93-107	96-104	97-103	96-104	95-105	98-102	98-102	100	99-101	97-103	100
Juneau	-	-	55-74	57-65	48-63	96-99	51-63	46-72	57-70	51-74	62-89	55-77	65-76
Chicago	-	131-147	143-151	136-142	137-147	146	144-167	145-153	136	128-135	158-161	146-151	149

Source: Monthly bulletins, Market News Service, Chicago, New York, Seattle.

for Seattle, Juneau, New York, and Chicago. There are some differences in classification of product between the Chicago and New York markets, as Chicago does not distinguish between fresh and frozen in their reported data. Because of seasonal variation in the catch and the problems of comparing prices under differing conditions, the number of months in each year when data could be compared is limited. July was selected arbitrarily for inter-year comparisons, and the mid-range of Seattle prices for that month were used as a base index from which comparisons were made to prices at Juneau, Chicago, and New York. The data and comparisons are shown in table 3-15. Inspection of the data reveals little about pricing trends. There is no recognizable tendency for margins to increase over time between Chicago and Seattle prices. When these margins are compared to fluctuations in the volume of supply in chapter II, there is no apparent tendency for margins to be adjusted in order to regulate the market.

The apparently random nature of the market must therefore reflect local rather than national market conditions: the amount of frozen salmon inventory overhanging the market, the flow of product from British Columbia which obviously must influence total supply.

The implications for channel structure from these data are that there is some concentration shown at the processor level. However, there is not a clear-cut pattern of dominance by either processors or buyers, and a reasonably competitive market would appear to exist.

Because there is a large portion of the market which is not measured by these data, and the possibility exists that there may be unspecified seasonal biases, any conclusion is extremely tentative.

The most important pricing transaction in the system would appear to be that between the processor and his markets as he searches out the highest offer.

Summary

This chapter has three objectives: to describe the flow of product to market, to identify and describe the market structure of the distribution channel, and finally to examine the competitive nature of the channel through evidence of price behavior.

1. The pattern of product flow clearly indicates that the markets for fresh and frozen salmon are not confined to any single region. Out of 66 million pounds of chinook and coho landed within the four states, 37.4 million pounds are distributed in fresh or frozen product form. This is almost equally divided among West Coast, Midwest, East coast markets, and exports to other countries. The export volume is primarily concentrated on movements to Britain and France who together absorb almost half of the overseas volume.

2. The distribution channels for salmon are divisible into two sets of vertically related organizations; one concerned with negotiation and transactions, and the other concerned with the physical flow of product to market. They are interrelated in that the transaction determines the physical movement of the product, and the constraints on product movement determine possible market

alternatives. Variations in the organization of channels precludes generalization about channel forms with the exception of a need to maintain flexibility in channel structure along with stability in the types of potential business relationships.

3. There is little acknowledged vertical integration in the channel with the exception of the link between receiving stations and processors.

4. The number of fishermen appears to be increasing in the face of a decline in the average size of the catch and hence average earnings, suggesting changes in the occupation of fishermen from full-time toward a part-time activity.

5. Receiving stations appear to have relatively low levels of concentration; however, many appear to be owned or controlled by processors.

6. The available data on processing activity does not suggest a high degree of concentration, at least among American firms. There is, however, some evidence of accumulations of market power among a few processors through large-scale buying operations.

7. The intermediary link of wholesaling appears to be declining, because of both high costs and the tendency for large chain buyers to deal directly with large processors.

8. The large retail chains appear to exert a countervailing force against the potential power of the large processor.

9. Price-making behavior within the channel, however, appears to be reasonably competitive in practice, based on the available evidence.

What can be inferred from the material available therefore appears to be that the structure of the channel operates in a reasonably competitive fashion. Whether the results of market behavior are in fact equated to competitive behavior can only be measured against comparative rates of return, on which data will be presented in chapter VI.

Chapter IV

THE PHYSICAL DISTRIBUTION OF SALMON

The channel of ownership--buying and selling--determines the character of competition. The ultimate constraint, however, on channel activities is determined by the sequence of processing, handling, and shipping activities in the physical distribution of salmon. The nature of the physical distribution process and the type of products offered on the market will determine the location of the market, both in time and space.

Physical distribution has been defined to include "the broad range of activities concerned with the efficient movement of finished products from the end of the production line to the consumer, and in some cases includes the movement of raw material from the source of supply to the beginning of the production line."[16] Physical distribution for salmon by this definition would include therefore the transportation, handling, holding, and preparation for shipment both from the fisherman to the processor's plant, and from the plant to the final markets. However, inventory decisions are inexorably linked to decisions on product form, so that a comprehensive definition should also include the processing function. Further, the definition of an efficient physical distribution system must include communication, not only in the manner in which orders are transmitted from one stage to another to initiate

[16] Donald J. Bowersox, Edward W. Smykay, and Bernard J. LaLonde, Physical Distribution Management (New York: Macmillan Co., 1969), p. 4.

shipments, but the degree of control which a processor can exert over the physical distribution system to ensure product quality and efficient performance. All of these functions are interrelated, since decisions in one functional area of physical distribution cannot be made independently of decisions in another.

The contribution of physical distribution to the effectiveness of salmon distribution cannot be overemphasized. The extent of the market for either fresh or frozen salmon is ultimately determined by the ability to move them to market with a minimum of loss of product quality. Because of the logical separation of functional activities of buying and selling from those of physical distribution, the distribution channel has evolved into two separate and often distinct systems of activity. There is, however, an inevitable interaction between the outputs of these two systems. The activities of change involve risk, as the act of holding title necessarily implies the possibility of either loss or gain in the market place. This risk can be reduced or shifted through successful management of physical distribution. The decisions on product form, distribution, and the location of markets will determine the size and the nature of the risks that the exchange channel must bear.

There are specific problems in system management which are unique to the activities of physical distribution. The problems

of channel control and coordination differ substantially from those of the exchange channel. In a system with independent ownership and management of the component firms, with dissimilar functions and technological characteristics, the task of coordination appears to be substantial. Evaluation of performance of the system is often weak, not only because of a lack of common standards, but because the information links are either intermittent (i.e., they are used only to report malfunctions such as failures to deliver on schedule) or operate with sufficient lag in reporting as to make corrective action difficult in the shortrun.

Within this system, there are conflicts of goals engendered by disparate technologies, which require compromise and bargaining in order for the system to operate.[17] As one example, the shipper and consignee will strive to ship in lot sizes convenient for themselves, and even so they may differ in definition of optimal size. When we add the carrier as the connecting link, his technological characteristics may encourage him to strive for large shipments in order to make efficient use of his vehicles. While conflicts such as these are resoluble, they are inherent within the physical distribution system and they further emphasize the inability of a single firm to control the system without complete vertical integration.

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[17] See J. L. Heskett and R. H. Ballou, "Logistic Planning in Inter-Organizational Systems," Academy of Management Proceedings (1967), pp. 124-136.

The task of this chapter is to describe the physical distribution system for fresh and frozen salmon. The concern is with both the nature of the decisions which must be made and the nature of the constraints which limit these choices. The section which follows will describe first an economic model for decision choice in physical distribution and efforts to validate it. This will be followed by a description of the fresh and frozen product distribution systems, and then a discussion of the major components in the physical distribution. In the final section this discussion will be summarized by identifying some of the major problems in this area.

I. A Model of Physical Distribution in Salmon

Decision choices in salmon products and distribution can be argued on a basis of risk management as well as on directly incurred costs. Risk affects product form, market choices, and all of the distribution decisions which follow from there. The first decision facing a processor is whether to sell his inventory in the fresh market, or to freeze some portion of his supply for sale in some future time period, presumably before the next season. We assume that he is not faced with allocation constraints requiring him to protect the supply of a given customer or group of customers but that he is concerned exclusively with unrestricted economic choice. The choice at the margin may be described as the net present value of two market prices, where

$$(1) \qquad E(P_{fresh}) = \frac{\text{Net } E(P_{frozen})}{(1+i)^n} \quad *$$

P_{fresh} is the current market price. P_{frozen} is the anticipated range of market prices for frozen salmon over the entire season. The expected value, $E(P_{frozen})$, describes the mean anticipated probability of price occurrence. The rate of discount over time is i, in this case to be considered the opportunity cost of capital to the firm. The term "net" describes price after freezing, physical processing, and holding costs, relating solely to the frozen product, have been taken into account.

Risks are made with uncertain market knowledge, and are particularly uncertain in the case of distant markets where direct inspection is impossible. Although supply risk may be reduced through quality grading systems, it is not completely eliminated, and a residual amount of risk is necessarily passed on to the buyer.

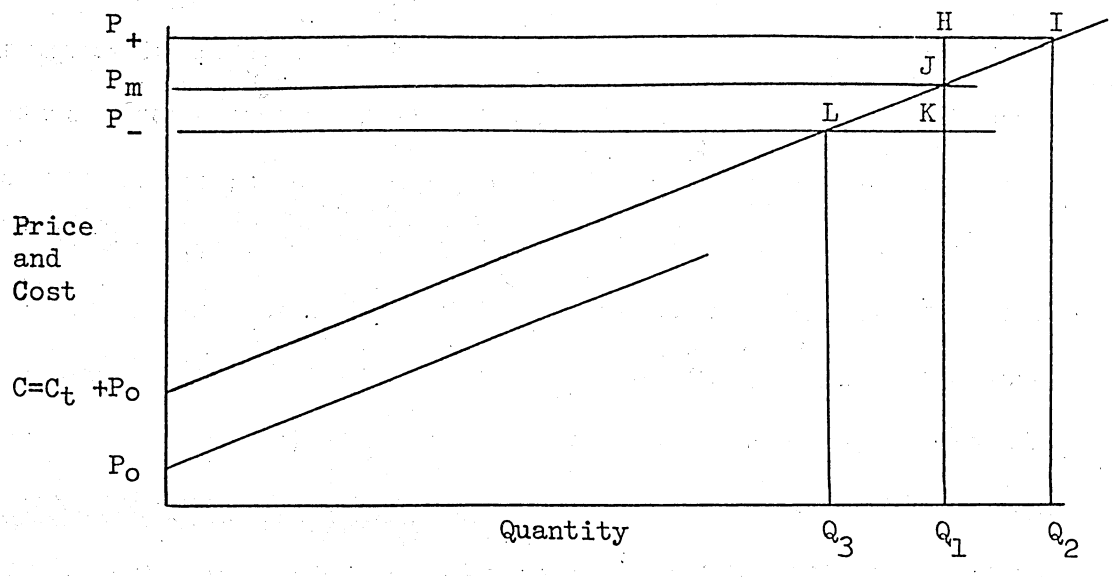
Price risk lies with the owner of the inventory. Owners for resale could have two types of risk--loss of value, i.e., a speculative loss of inventory value, or a loss of potential value through postponing commitment to markets. It is characteristic in this industry to avoid commitment of inventory to specific markets because of the potential speculative loss, which would appear to overshadow potential postponement losses.

The risk problem can be demonstrated in the hypothetical market situation described in figure 4-1.

*The exponent n is the pertinent time period and must agree with the value of i used.

Figure 4-1

Risk and the Market



To examine the decision of a single shipper to move salmon to one market considered in isolation, assume that this shipper is buying in a competitive market and that he is contemplating supplying a market in another location which is also competitive. Let P_o be the price at which the shipper is buying in the local market. As he continues to purchase, he and his competition will bid up the price of the salmon resource. In addition he must add a transportation charge, C_t, so that his cost of supplying additional units must be the marginal cost curve, $C = P_o + C_t$. Because of the increased buying prices that he encounters, C is positively sloped to the right because increased quantities will only be available at a higher price.

In deciding to ship to his destination market M, the shipper believes that price, P_m, will prevail and therefore ships quantity Q_1 to that market, i.e., he will continue to ship until the marginal revenue (price P_o) that he obtains is equal to the marginal cost C. Price P_m, however, is only the modal value of possible prices whose range is given by alternative prices P_+ and P_-. If he were to anticipate that prices would rise to P_+, he would maximize his profits by shipping quantity Q_2. Similarly, if he were to predict that the price would decline to P_-, his best strategy would be to ship quantity Q_3. However, these prices are not known with certainty, and therefore the shipper then exposes himself to two types of risk. The first is that of failing to achieve profits which might be available if prices were to increase to P_+; he has therefore accepted a risk of postponement, that even though he will realize the additional profit from Q_1 denoted by P_mP_+ HJ, he could have gained the additional profit HIJ. At the same time, he has exposed himself to the possibility of loss by overcommitment to the market. While he realizes the lesser profit denoted by the triangle CP_-L, he has also incurred the loss from his inability to foresee the price decline, KJL, which is the loss from speculation shipping the quantity Q_1-Q_3.[18]

The expected total profit function can thus be written:

$$E(\pi) = PR_1 [P_m - c(Q)Q_1] + PR_2 [P_+ - c(Q)Q_1] + PR_3 [P_- - c(Q)Q_2] - PR_3 [P_m - c(Q)(Q - Q_3)]$$

[18] See Louis P. Bucklin, "Postponement Speculation and the Structure of Distribution Channels," Journal of Marketing Research, (Feb. 1965), pp. 26-31.

where:

$E(\pi)$ is expected profit;

PR_1, PR_2, and PR_3 are the probabilities of occurrence of the three prices P_m, P_+, P_-, respectively; and

$c(Q)$ is the function C.

Because of the actual cash loss if the price falls to P_-, the actual penalty of postponement risk may be higher than that of postponement, probabilities of price fluctuation being equal, and would only be equalized if the potential profits from the possible price increase were sufficient to balance out the lower profit from a price reduction.

With market imperfections such as a time requirement to search the destination market for buyers, or if the ability of the market to take additional quantities is limited, there may be additional losses. In the fresh salmon market, the limited shelf-life of the product dictates an almost complete loss of inventory if the product is not sold within a short period of time. In the frozen market, other options such as holding inventory for future sale or moving the inventory to other locations may limit the losses to transportation or holding costs. Even in this case, however, the number of market alternatives is limited because transport and inventory costs comprise a substantial part of the profit margin, and some alternatives incur the possibility of loss. This helps to explain the lack of speculative interest in fresh fish inventories and the limited speculation in market-oriented inventories of frozen stock.

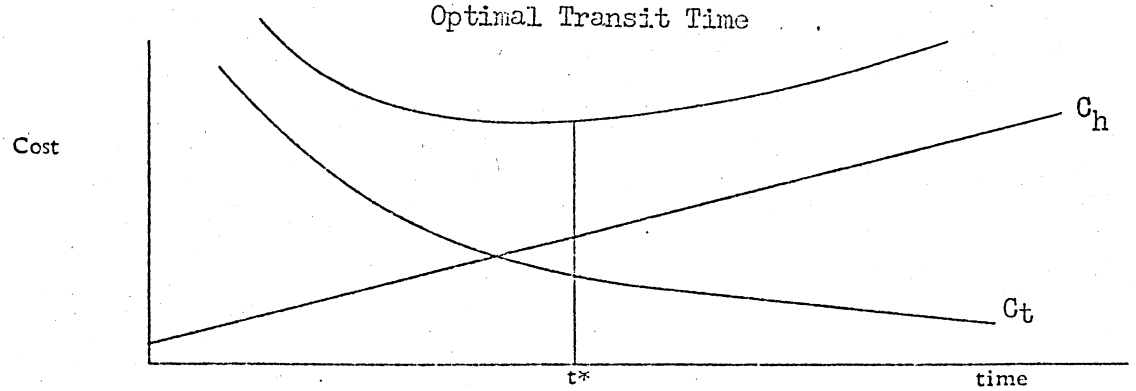
When the effect of the risks of postponement and speculation are included within a profit estimate, the resulting decisions appear to become conservative; there will be less salmon placed in the fresh market, and the amount of fresh salmon shipped into a specific geographic market will be less than if these risks were not present. Risk as well as profit enters into the distribution decision, and risk may therefore be considered part of the cost of holding inventory.

Physical Distribution System Characteristics

Physical distribution activities, apart from the processing decision, involve two basic activities: holding inventory and moving it to market. Holdings costs (C_n), both risk and direct expenditures, are increasing functions of time; movement costs (C_t) are decreasing functions of time in that faster transportation involves higher costs than do slower forms of transport. In every system there would appear to be an optimal transit time by which the costs of the system are minimized, i.e., the marginal exchanges between holding and movement costs are balanced. This is shown in figure 4-2.

Figure 4-2

Optimal Transit Time

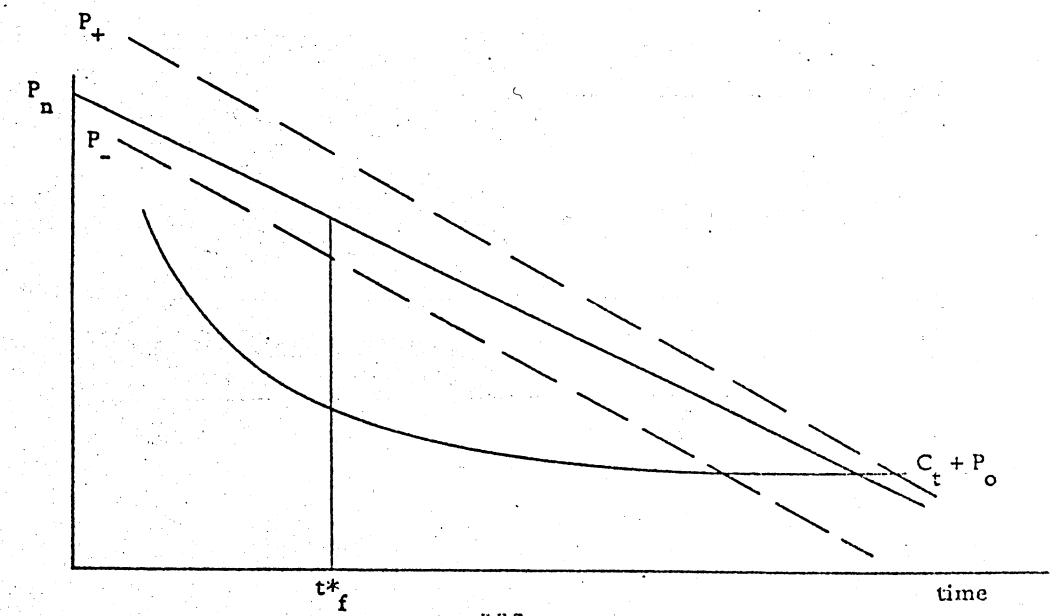


Specific types of holding costs would include not only risk but opportunity costs of capital, direct costs of warehouse operation, and in the case of frozen salmon, the costs of holding at cold temperatures and reglazing. Movement costs involve not only the choice of transport mode, but the frequency of vehicle scheduling, warehouse processing capacity, and similar possible sources of delay.

Fresh and frozen products take different distribution time allocations. Because of the high risk of speculation, fresh fish are sold directly from the producer's inventory to buyers. The seller's strategy is therefore to hold his inventory for the highest possible price, but quality will begin to deteriorate immediately, and the time delay becomes critical. Risk is therefore balanced between failure to obtain the highest possible price and the risk of loss of value of inventory. In figure 4-3 below we have assumed

Figure 4-3

Distribution Choice for Fresh Salmon

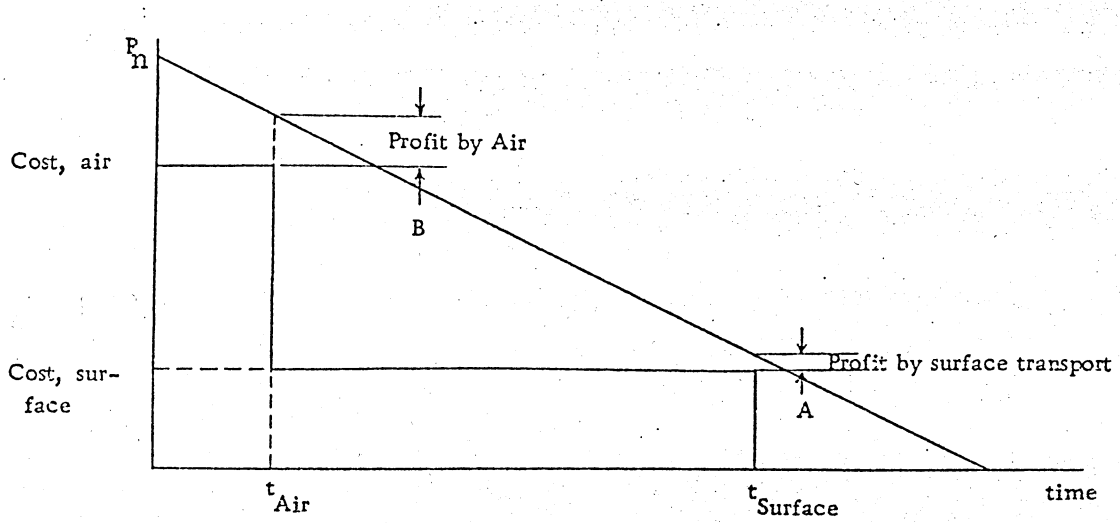


an average price (P_n) decline as a function of shelf-life, with possible prices above and below the average. Total cost of fish to the supplier (price P_o) plus movement cost (C_t) will decline because of the loss of quality, and the optimal time would be t_i^* where the expected value of profits will be maximized.

The actual movement possibilities are limited and therefore can be described as the discrete choices shown in figure 4-4. For a given market there will be one or two modes of transport. In moving salmon from Seattle to Los Angeles, for example, there are two modes of transport, motor carrier and air freight, denoted by points A and B. The decision of which mode to use will be determined by the distance (measured vertically from line P_n to A and B). The greatest distance, i.e., the largest profit, would determine the choice.

Figure 4-4

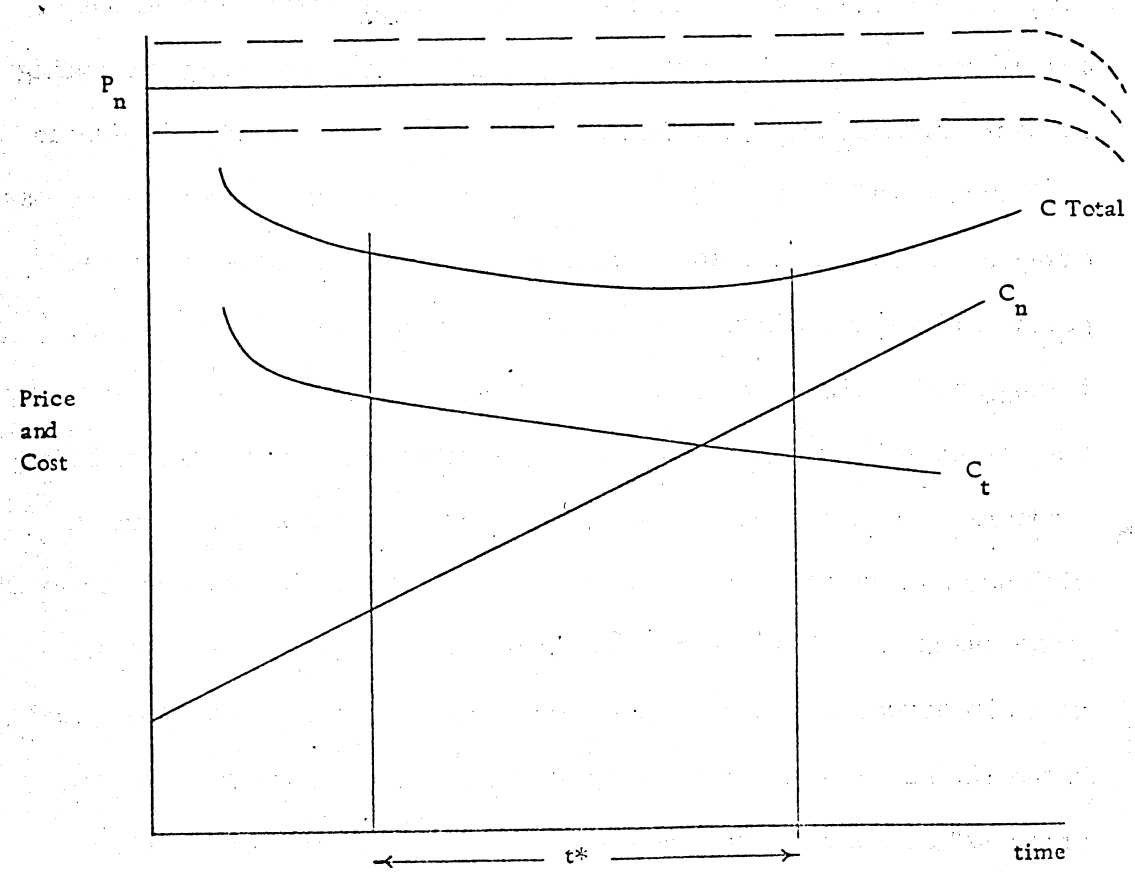
Transport Choice for Fresh Salmon



The optimal time dimension for frozen product is much longer for frozen than for fresh, because of the much longer shelf-life and hence the less rapid deterioration in price. Decisions to sell can be less time-dependent over a season, determining less costly but more time-consuming distribution practices. At the same time there are increasing holding costs for maintaining frozen inventory. The relationship can be seen in figure 4-5.

Figure 4-5

Distribution Choice of Frozen Salmon

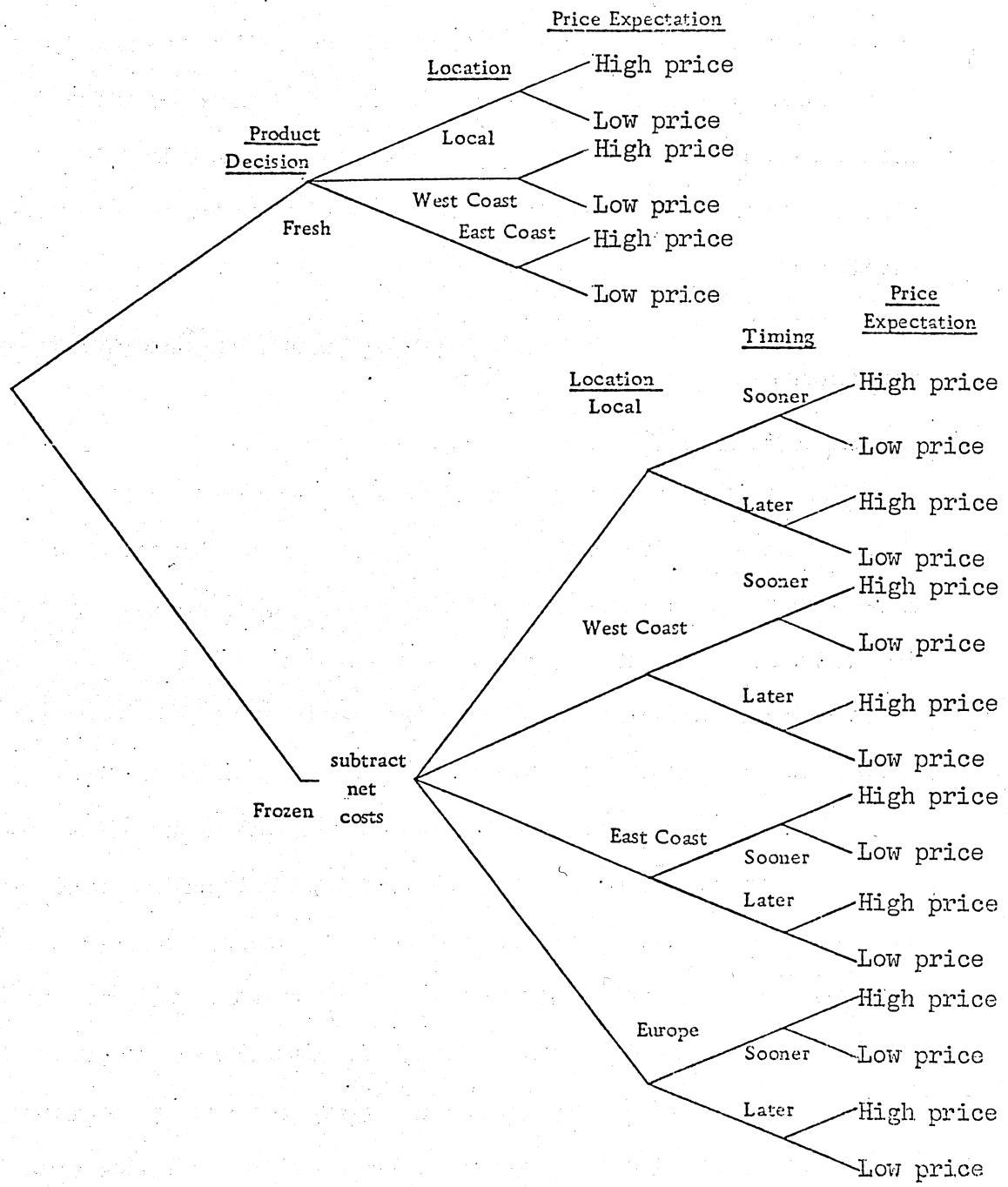


The cost functions are relatively insensitive to small changes in time, and decisions can therefore be made primarily on expectation of price behavior, rather than either shortrun physiological or technological constraints. Price risk therefore becomes the determinant of both product and market decisions for frozen salmon. Prices are presumed to be determined by supply and demand conditions, and if decisions are made on the basis of the expected values of prices, then demand indicators should reflect price changes and hence product choices. This is tested in the succeeding section.

A simplified structure of the total product and distribution decision can be seen in the decision tree of figure 4-6. The two branches are fresh and frozen products, values for which in turn are determined by prices in local markets, which can vary according to some distribution of values. The combined expected returns for each product will determine the decision, which is determined by the expected values of prices in each market. In the case of frozen product there are three additional elements to consider: market timing, net costs, and time discounting. Assuming that cold storage facilities are available, marketing strategies may involve offering products to markets at various times throughout the year, and decisions will be made based on the expectation of the highest possible price based on timing, i.e., the market. Net costs would be those uniquely associated with frozen products. Assuming that these are known with reasonable certainty, they are combined with expected price values, and these are equated to a decision to sell fish

Figure 4-6

Decision Tree for Salmon Distribution



immediately as a fresh product by the discounting term i, the value of i being the opportunity cost of capital to the firm. The normative product decision is thus inseparable from the marketing decision in that it is based on comparative returns. In addition the product decision determines the logistic channel in terms of processing, warehousing, and transportation. To the extent that decisions are made on rational grounds without consideration of other factors, a model based on rational economic decision criteria should enable us to predict decisions within the firm. If it does not, then the only conclusion possible is that other factors predominate.

The Product Form Decision

The decision by processing firms to produce either fresh or frozen salmon for the market would presumably be a function of several variables, including relative returns, estimated supplies in the market, and the desire to protect established markets and customer relationships. While all three are classed as economic variables, the first two assume shortrun rationality on the part of producers; the third may be considered in the nature of a long-term investment. Product form decisions would therefore appear to be responsive to managerial perceptions and anticipations of price and the quantities available, with residual portions assigned to fresh and frozen product forms to satisfy established markets.

To test this, the concept of an aggregate industry decision process was hypothesized in which industry output could be explained

by changes in supply, price, and factors affecting price. Two techniques, multiple regression and causal path analysis, were used to identify the critical variables which would determine the industry percentage choice of fresh and frozen salmon.

The dependent variable was the percentage of fresh to the total of fresh and frozen salmon. The independent variables as shown in appendix table C-1 were selected to include supply quantities, measures of returns in the Seattle and Chicago wholesale markets, frozen inventory positions from the previous season as of April 30, and net consumption of frozen salmon from inventory over the period from October 31 to April 30.

The regression results do not appear to be satisfactory. The strongest correlation was with frozen inventory as of October 31.[19] However in this case it would appear that causality is reversed, and that the decision to divert more product into the fresh market results in slightly lower inventories of frozen product inventory at the end of the producing season. The determining factors are not indicated by this equation.

Further analysis was attempted by means of a causal path analysis program which generates a matrix of simple correlation coefficients among variables and combines it with a matrix of

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[19] The equation was $Y = 295.32 - \underset{(4.45)}{.00109X_1}$ $\quad r^2 = .6871$, SE = 32.071

where Y = percentage fresh to total of fresh and frozen and X_1 = frozen inventories on hand as of October 31.

potentially significant relationships as determined by the analyst on an a priori basis and then generates a causal path, linking variables by partial regression coefficients. The path is linked only if the coefficients are significant above a specified level, in this case, 0.05. The matrix is shown in appendix table C-2. There were no correlations of sufficient statistical significance to make the program operate, and therefore the results are inconclusive.[20]

The data are limited, and it may well be that different series describing the same phenomenon would indicate better relationships. While the correlation matrix does show positive association between Chicago and Seattle prices and to a lesser extent with landing volumes, this is not useful in describing the product form decision.

This can only be a brief examination of the problem in the context of the much broader study of channels. Both at the aggregate and at an individual firm level, the data available to this study do not permit us to confirm the economic model presented earlier. Typically, many processors in Oregon and California described the decision as an action to freeze what was left over at the end of the day, implying that the relevant data would be daily in nature and not in annual terms. One small wholesaler describes the decision to freeze as a decision in anticipation of higher prices, a "safe"

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[20] The program was run using ICL 1909 computer at the University of Bradford, England, using a program designed by Martin Christopher and Kenneth Elliott. For an explanation of causal path analysis see Christopher and Elliott, "Causal Path Analysis in Market Research," Commentary (April, 1970).

decision only if prices continue to rise and oversupply does not appear in frozen stocks.

Research in this area might profitably take the form of a heuristic investigation, studying different operators and their decision processes. Other analyses might probe this question in direct interviews. At this stage it is by no means clear what factors specifically enter the decision to sell or freeze.

II. The Distribution of Fresh Salmon

The interaction of product form and the character of the logistics system is nowhere more clearly demonstrated than with fresh fish. Because of its relatively high value in the market, fresh salmon appear to possess more options in the choice of transportation and markets than do other species of fish. The problems, however, are similar for all species: limited time spans between the catch and spoilage.

Fresh salmon has been described as having a maximum shelf-life of 15 days, with a progressive deterioration setting in before that time. Industry practice has emphasized speed of delivery as the salient characteristic of the distribution system, as fresh fish bring both higher prices and customer preference. This has dictated a uniquely determined distribution system for salmon: minimal delays in transit, with a maximum time in transit of two to three days, and inventory maintained only at the retailer's counter. Occasionally during this study there were cases observed where incoming fresh salmon inventories were held as much as two days before

being worked, but this was unusual; most processors described typical cycle times involving receiving the fish at a receiving station in the late afternoon with shipment in the evening for early morning delivery to the processor. The processor would then prepare the fish within the day and ship that evening. One variable beyond the control of the processor is the length of time that the fishing vessel remains at sea. Areas where small boats are used extensively are known in the wholesale trade for the superior quality of their catch, since small vessels tend to return to dock sooner than larger vessels.

Because of the time constraint, market areas for fresh salmon tend to be confined to local markets, those parts of the West Coast accessible to high speed motor or air transport, or Eastern and Mid-western markets which are served through air freight almost entirely. The geographic extent of the fresh market can be seen in table 4-1, where all respondents were asked to define market areas for their fresh product form.

Table 4-1

Market Area Versus Product Form
Number of Firms

Firm Product Form	Local	In-State	West Coast	Midwest	East	Export	Total
Fresh only	5	5	8	-	-	-	18
Frozen only	3	1	7	2	7	14	34
Fresh and Frozen	18	6	25	9	17	18	93
TOTAL	26	12	40	11	24	32	145

Source: Survey data

These data include all types of firms, not only processors but wholesalers and retailers as well. However, because the channels have been sufficiently pluralistic in form, e.g., wholesalers may ship to wholesalers in other areas, the above data will loosely define the market. Smaller firms tend to ship fresh only, while larger firms ship both fresh and frozen fish, and it was difficult to distinguish their product shipment patterns by geographic region.

Delivery of fresh salmon to market involves two modes of transport: air and motor. Motor carrier delivery of fresh salmon is primarily confined to West Coast points. Not all processors have equal access to all markets, because this is a function of the transportation services available. While some Seattle and Astoria, Oregon, producers reported little difficulty in moving fresh salmon into Los Angeles, other processors reported problems in reaching all parts of that market area, to the point of discontinuing shipment because of transport problems. Occasional shipments by motor carrier were reported into the Midwestern and East Coast markets, but these were not significant compared to air freight volume; transit time by motor carrier is 4 to 5 days and hence is not normally attractive for fresh movements.

The rate structure for transportation services has encouraged the development of two specific forms of transport: air freight and fisheries-exempt motor carriers, the latter being a group of carriers exempt from rate regulation in interstate commerce, of

which more will be said later. The exempt carriers do not publish tariffs, although they are willing to quote prices informally to shippers from preset price lists. Table 4-2 indicates typical prices which were quoted for fresh movement during the period of the survey in August 1969. These can be compared with the specific commodity rates quoted by the Pacific Inland Tariff Bureau on their Tariff 79, shown for fresh movement in table 4-3. During the time that this study was in process, this tariff was cancelled, forcing would-be shippers either to use the exempt carriers or pay higher rates via common carrier.

The air freight industry has looked at salmon as a particularly attractive form of traffic because it provides an important balance to the movement of other traffic into the Pacific Northwest. As a result, the major carriers have offered special rates on the movement of salmon as well as other seafood into the Eastern markets. Air freight rates are shown in table 4-4. Compared to motor carrier rates, there appear to be fewer breakpoints for volume discounts, and these are at lower volumes. Thus air freight shipments appear to be smaller than those of motor carriers, although there are no data to confirm this more directly. Data on the volume moving via either mode are fragmentary. The volume moving by air into the New York wholesale market has increased for the 3 years 1966 to 1968, as described in table 4-5. These data do not include fish moving outside of the wholesale channel, nor are similar data available for other markets. Because of the cost of air movement

Table 4-2

Typical Motor Carrier Rates for Fresh Salmon from Processor to Major Domestic Markets - August 1969
($/100 lb)

Carrier	Origin	Destination	Minimum Charge	LTL*	1,000 lb	5,000	10,000	20,000	30,000
A	Oregon Coast	San Francisco	5.00 min	5.00	2.94	2.80	2.66	2.25	1.88
A	Oregon Coast	Los Angeles	6.50	6.50	4.00	3.85	3.64	3.28	2.20
B	Oregon Coast	San Francisco	4.50	4.50 + 25% for ice	2.80	-	2.11	-	-
B	Seattle	Los Angeles	5.20	5.20 + 25% for ice	3.50	-	-	2.95	-
C	Astoria, Oregon	Los Angeles	13.68	1.27		5.98	-	2.78	2.44
D	Portland	Los Angeles	-	2.80	-	-	-	-	1.25

*LTL = less than truckload quantity

Source: Direct interviews. Carriers wish to reamin undisclosed.

Table 4-3

Motor Carrier Rates for Fresh Salmon as Published in Pacific Inland Tariff Bureau Tariff No. 79 as of July 10, 1969

	Portland San Francisco	Portland Los Angeles	Seattle San Francisco	Seattle Los Angeles
	$/100 lbs.			
Minimum Charge	$15.75	$15.75	$15.75	$15.75
LTL	10.94	14.64	12.54	16.20
5,000 lb. minimum	4.78	6.40	5.49	7.08
20,000 lb. minimum	2.06	2.89	2.40	3.35
30,000 lb. minimum	1.74	2.54	2.03	2.91

Icing charge $9.08/100 lbs of ice used subject to minimum of 100 pounds.

Note: Tariff was cancelled as of 1/10/1970.

Source: Pacific Inland Tariff Bureau, Tariff No. 79, Portland Oregon

Table 4-4

Typical Air Freight Rates for Salmon from
Processing Centers to Major Domestic Markets
($/100 lbs.)

Origin	Destination	100 lb min	500 lb min	1,000 lb min	2,000 lb min	3,000 lb min	5,000 lb min	10,000 lb min	Airline Item No.
Alaska to West Coast & Eastern Markets									
Ketchikan	Seattle	$ 8.00	-	-	-	-	-	-	WA 435
Anchorage	Chicago	20.20	-	$20.00	$19.60	$19.20	$18.90	$18.60	NW 435
Anchorage	New York	24.25	-	-	23.45	23.15	22.85	22.45	NW 435
Anchorage	Washington D. C.	23.90	-	23.50	22.40	22.00	21.70	21.50	NW 435
Anchorage	Portland	9.50	-	-	-	-	-	-	NW 435
Anchorage	Seattle	8.50	-	-	-	-	-	-	NW 435
West Coast									
Vancouver	Los Angeles	9.50	-	8.50	-	-	8.00	-	WA 435
Portland	Los Angeles	9.00	-	8.00	-	-	7.00	-	WA 435
Portland	Los Angeles	8.75	-	7.75	-	-	7.00	-	UA 4
Seattle	Los Angeles	9.75	-	8.75	-	-	8.00	-	UA 4
Seattle	Los Angeles	11.80	-	11.00	10.45	9.95	9.65	9.50	WA 435
Portland	San Francisco	5.75	-	-	5.65	5.30	5.05	4.95	WA 435
Portland	San Francisco	6.25	-	-	-	-	6.00	5.95	UA 4
West Coast to Mid-West and Eastern Points									
Seattle	Chicago	10.60	-	9.90	8.50	8.50	8.50	8.50	UA 920
Seattle	New York	14.75	14.75	14.75	10.00	10.00	10.00	10.00	UA 920
Portland	Chicago	10.60	-	9.90	8.50	8.50	8.50	8.50	UA 920
Portland	New York	14.75	-	-	10.00	10.00	10.00	10.00	UA 920

Source: Northwest Orient Airlines (NW) Domestic Cargo Rate Information Guide, Issue No. 2.
United Airlines (UA) Memorandum Tariff III (August 1969)
Western Airlines International (WA) Specific Commodity Rates Applicable to the Evergreen Region (6/25/69)

Table 4-5

Volume of Salmon Air Freight in the
New York Wholesale Market by Area of Origin
1966-1968

	lbs (000)		
Origin	1966	1967	1968
California	347.0	159.3	397.6
Oregon	164.4	165.2	125.5
Washington	165.1	179.6	233.6
Alaska	12.6	9.5	34.7
British Columbia	20.5	205.6	125.1
	709.6	719.2	906.5
Chinook as % of Total	60.4%	61.2%	58.5%

Taken from U. S. Bureau of Commercial Fisheries, Market News Service, Monthly Review of New York Market--selected issues.

of 10 cents per pound into the New York market, there has been a preponderance of chinook in this movement, undoubtedly reflecting the higher value per pound of the species. Shippers also reported in 1969 that they were shipping fresh salmon to Europe by air at rates of 31 to 38 cents per pound. From customs data, this movement would appear to be small in volume. However as 1969 was the first year in which this became significant, it may portend future growth as European demand increases.

In fresh salmon movement, transportation dominates the other elements in the system because of the time constraints within the system. Inventories can only be maintained at the point of sale, and the speculative risks therefore fall on the local wholesalers and retailers who are close to the final markets. Processors on the other hand will avoid speculation, only shipping on orders from customers, because the risks for fresh salmon en route to the market appear to be too high to absorb.

The Distribution of Frozen Salmon

Transforming fresh into frozen salmon removes the time urgency of moving the product to market. Freezing and portion-control processing of salmon are normally, although not always, accomplished by the processor, at least within the continental U.S. In Alaska, data on Alaskan freezing operations indicate that independent cold storage warehouses freeze between 50 and 100 percent of total Alaskan production, without taking into account the Alaskan fish processed or frozen in the State of Washington.

The market structure of Alaskan cold storage and freezing facilities shows a high degree of concentration, as table 4-6 indicates. The three major public cold storage facilities in the Puget Sound provide an alternative, but comments from processors have indicated that cold storage capacity in that area is also limited.

The availability of cold storage facilities may act as a constraint on the product form choices open to processors. In California and Oregon there appears to be a scarcity of public cold storage facilities, and several processors have indicated that for this reason they prefer to sell their product in fresh form, rather than ship it elsewhere for freezing, with additional transport charges and prospective losses in quality. The impact of cold storage capacity on product form and hence market form decisions cannot be measured directly, as only public cold storage capacity is reported, and it is uncertain how much of this is potentially available for holding salmon. There is, however, a considerable amount of privately held capacity within the industry which is not publically available information, adding further conjecture to any appraisal of the situation.

The decision to freeze salmon adds to the cost of the product in several ways--the freezing process itself, handling in and out of the storage area, and higher charges in transportation because of colder temperatures required in transit. Typical

Table 4-6

Cold Storage and Freezing Volume by Processors
--1,000 Pounds--

Processors	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	1968
Alaska Fish & Farm Products Co.	25	24	29	76	19	29	34	22	156	--	--		
Alaska Ice & Storage Co.								78		351	978	221	755
Aleutian Cold Storage Co.	912	158	--	--	--	750	--	682	210	242	91		
Juneau Cold Storage Co.	153	685	1,218	1,201	1,317	1,221	1,314	2,776	2,277	2,246	2,682	2,006	2,787
Ketchikan Cold Storage Co.	1,327	1,300	905	729	757	840	1,270	328	1,061	822	1,818	931	
Pelican Cold Storage Co.	2,893	3,088	2,491	1,827	1,848	1,482	1,857	1,153	2,221	2,364	2,823	1,213	1,535
Petersburg Cold Storage Co.	239	386	538	778	485	487	--	--	1,641	1,296	2,001	2,515	2,447
Sitka Cold Storage Co.	861	427	339	500	340	438	488	1,346	1,361	1,078	900	368	735
Wrangell Cold Storage Co.	364	NA	410	NA	NA	NA	NA	271	336	NA	NA	NA	NA
Farwest-Wrangell Co.	NA	412											
Tokeen Ice & Cold Storage Co.	NA	411											
Total Above	6,774	6,891	5,930	5,111	4,766	5,248	4,963	6,656	9,263	8,399	11,293	7,254	8,259
Total Alaska	8,603	6,891	5,879	6,298	6,053	7,160	8,795	8,236	13,164	7,684	14,631	9,727	17,492
Percent of Total Alaska Production	78.7	100.0	100.0	81.4	78.7	73.2	56.5	80.5	70.4	100.0	77.0	74.6	47.3

Source: National Fisherman, annual issues.

charges by a major public cold storage warehouse in the salmon producing area will illustrate these costs, shown in table 4-7.

Table 4-7

Typical Cold Storage Warehouse Charges
June 1969

Freezing	$2.00/cwt
Received frozen - handling and first month's storage (in boxes)	.83/cwt
Storage (per month)	.27/cwt
Boat unloading - fresh	.50/cwt
Boxing fish - Men (per hour)	5.20
Cartons	$ .65 - $3.30 each, depending on size
Wood boxes	$2.00 - $8.00 each, depending on size

Source: Cold Storage Warehouse Tariff

From these figures it is clear that the act of freezing will add from 3 to 33 cents per pound to the cost of fish depending upon the length of time the fish remains in the warehouse. There is some variation in public warehouse charges; holding costs per month appear to range from 27 to 32 cents per 100 pounds for the warehouses included in this survey. When these costs are compared to the margins developed in the preceding chapter for the wholesale-processor price differences, it becomes evident that freezing salmon for markets later in the year becomes quite speculative in terms of net potential profits.

Inventory strategies would appear to vary by species. In figure 4-6 inventory positions in public cold storage warehouses by month for chinook and coho salmon are examined over the period from January 1966 to December 1969 for the two most significant census regions from the standpoint of inventory holdings: the Pacific-Alaska and the North Atlantic (New England and Mid-Atlantic States). The two species exhibit distinctly differing patterns. Chinook inventories accumulate in both areas as the catch is produced, but the North Atlantic peak is a reflection of the Pacific-Alaska peak displaced by 2 months. This indicates that inventories are shifted toward the market almost immediately. In contrast, coho inventories appear to be accumulated only in the Pacific-Alaska area, and the absence of peaks in the North Atlantic area suggests that holdings in that market are primarily a working inventory, not intended to establish speculative positions.

The difference in practice may be attributed to differing end product markets. While coho are sold as frozen fish, dressed in half, whole or sliced form; chinook are often used as input to other processes such as smoking. These processors apparently need to secure the year's inventory as it becomes available in order to sustain their own production during the winter season. The result is that they are in effect taking a speculative position in the salmon market. In contrast, coho stocks are held close to the source so that processors may speculate by taking advantage of price changes in any of their markets and avoid commitment of

inventory until sales are firmly in hand. Stockholding decisions with these two species are a demonstration of the "Postponement-Speculation Priniciple," that holding inventory is the physical activity which shifts risk and uncertainty and that the location of inventory is the result of efforts to minimize risk in the channel.

In chapter III we have traced the major movements of salmon from producing areas to market. In general there are four major categories of movement of frozen salmon products: Alaska to mainland, West Coast intraregion, West Coast to Midwest and East Coast, and West Coast to Europe. One major processor reported his average transport costs to his major markets, and these are shown in table 4-8.

Table 4-8

Summary of Transport Costs Reported by One Northwest Processor in Survey, August 1969

Average Cost to West Coast from Northwest Points	.0263 cents/pound
Average Cost to East Coast from Northwest Points	.033
to Europe	.065
to Japan	.055

Source: Survey data

What is surprising about these data is how little effect distance has on comparative transportation costs. While waterborne movements cost less per mile than motor carrier movements, the price

differences necessary to make distant markets at least equally attractive as local markets are small.

From Alaska, almost all salmon which is not canned or mild-cured moves in frozen product form via waterborne container, rail car on barge, or truck over the Alaska ferry system. There is some variation in the price structure depending on the carrier. In table 4-9, comparisons are made between the two major carriers from Anchorage to Seattle, and rates from Ketchikan to Seattle and Ketchikan to New York are shown. These last two and the Alaska steamship rate from Anchorage to Seattle are joint rail rates involving carload movements. Even these rates reflect distance less than quantity, as the incentive price structure for shipments of larger quantities is very much in evidence.

The movement of frozen salmon in the United States is performed by either rail car or motor carrier. By far the majority of processors appeared to use motor over rail. This is probably accounted for by the lack of rail sidings available at the processors' plants, the lower minimum quantity requirements with motor over rail movement, and the relative costs of movement by rail versus truck for various markets. Rates for the movement of frozen salmon by motor carrier are shown in table 4-10, for the exempt carriers, and 4-11 for the regulated motor carriers. Exempt carriers generally charged higher rates for frozen than they did for fresh fish (see table 4-2) but maintained the same weight breaks. The regulated carriers not only charged higher

Table 4-9

Freight Rates on Salmon
from Alaska Points to Mainland
August 1969
($/100 lbs.)

Weight	Anchorage to Seattle Sealand to Alaska Steamship Tariff 116 Item 1150	Trainship Tariff 70A Item 1472
LTL[1]	$3.92	
5,000 lbs.	3.60	
16,000	2.62	
24,000	2.07	
36,000	1.96	
52,000		$1.64[2]
72,000	1.81	
80,000		1.53

[1] Less than truckload.

[2] Plus refrigeration charge of $210/car.

	Ketchikan - Seattle (Alaska Steamship Co.)
20,000	$1.71/100 lbs.
24,000	1.50

	Alaska Steamship Tariff 867
Ketchikan - New York	$3.56/100 lbs.
Ketchikan - Chicago	2.98/100 lbs.

Transcontinental Freight Bureau Tariff TCFB-2H

Table 4-10
Typical Motor Carrier Rates for Frozen Salmon
From Processor to Major Domestic Markets - August 1969
($/100 lbs.)

Carrier	Origin	Destination	Minimum charge	LTD	1,000 lbs.	5,000 lbs.	10,000 lbs.	20,000 lbs.	30,000 lbs. & over
A	Oregon Coast	San Francisco	$5.50	5.50	2.71	2.18	2.08	1.78	1.37
A	Oregon Coast	Los Angeles	6.50	6.50	2.96	2.46	2.24	2.01	1.50
B	Seattle or Oregon Coast	San Francisco	6.50	2.10	1.98	1.85	1.75	1.60	1.35
B	Seattle or Oregon Coast	Los Angeles	7.50	2.65	2.40	2.10	2.00	1.85	1.50
E	Astoria	Seattle	2.58			1.55	1.15	$135 for truckload in excess of 10,000 lbs.	
Other areas - truck load									
B	Seattle	Chicago	$2.50/100 lbs. in truckload quantities						
	Seattle	New York	3.50/100 lbs.						

Source: Direct interviews. Carriers wish to remain undisclosed.

Table 4-11

Motor Carrier Rates for Frozen Salmon as Published in Pacific Inland Tariff Bureau Tariff No. 79 as of July 10, 1969

	($/100 lbs)			
	Portland San Francisco	Portland Los Angeles	Seattle San Francisco	Seattle Los Angeles
Minimum Charge	$15.75	$15.75	$15.75	$15.75
LTL	10.94	14.64	12.54	16.20
10,000 lb Min.	2.13	2.20	2.30	2.65
20,000 lb Min.	1.77	1.85	1.93	2.25
30,000 lb Min.	1.27	1.39	1.45	1.66

Icing charge: $9.08/100 lbs. of ice used, subject to minimum of 100 pounds.

Table 4-12

Average Freight Costs to European Markets For Frozen Salmon - August 1969

Seattle to United Kingdom	$5.70/100 lbs.
Seattle to France, Lowland Countries	5.65/100 lbs.
Seattle to Germany, Denmark	5.65/100 lbs.
Seattle to Norway, Sweden	5.70/100 lbs.

Additional insurance charge
(based on value C.I.F. plus ten percent) $.55/$100 valuation

Handling charges $3.50 to $5.00/ton depending on whether palletized or not. Pallet costs based on 1600 pound/unit.

Tare weight = ten percent of gross weight.

Source: Direct interview with processor.

rates but extended the first break from 5,000 to 10,000 pounds. Whether this represents a reflection of market practice of accommodating larger quantities per shipment or the cost characterisitics of carriers is unclear. Rail rates, by comparison, to Midwestern and Eastern points for frozen salmon were $1.91 per 100 pounds to Chicago and $2.58 per 100 pounds to New York, based on a minimum carload quantity of 52,000 pounds.

Waterborne shipping costs are determined by negotiations with individual shipping conferences. One major shipper quoted his shipping costs to various European countries, but the minimum quantities required were not disclosed. These charges are shown in table 4-12. The movement of salmon to overseas markets has been dependent on a number of factors: refrigeration capacity on ships, dock refrigeration capacity to hold for transfers to land transport, and refrigerated land transport at the destination country.

The Use of Transportation in the Distribution Channel

The choice of modes of transportation is influenced by product form, location, destination market, and relative position in the channel. While there are four basic modes of transportation, air and sea involve special situations. The bulk of salmon traffic within the U.S. appears to be carried by truck, although there is some rail participation in the long-haul movement to market.

In this survey, it was difficult to classify transport movements either by product form or between stages by the mode of

transport, not because of the ambiguity of transport choice but because the patterns of channel activity are heterogeneous, and most firms which were interviewed were not prepared to describe their transport movement in the level of detail required. In general there are some strongly persisting transport patterns, which can be identified despite these ambiguities; these are shown in table 4-13.

Table 4-13

Transport Mode by Firm Type and Direction of Movement

	Own Truck	Rail	Air	Ship	Common Car. Truck	Customer (supplier) Truck	Totals
INBOUND							
Whl only	5		1		9	4	19
Whl - Ret	10				9	6	25
Processor	4	1	1	4	3	3	16
Pro - Whl	10	1	2	1	8	2	24
Broker			1	4	5		10
Buyer					2	1	3
Retail only	2				1	4	7
Totals	31	2	5	9	37	20	104
OUTBOUND							
Whl only	10		4		13	3	30
Whl - Ret	14	1	4		5		24
Processor	4	4	1	4	8		21
Pro - Whl	8	3	7	6	12		36
Broker		2	2	4	7		15
Buyer	2	1	1	1	1	1	7
Totals	38	11	19	15	46	4	133

Note: Many firms use multiple modes, such as rail and truck. There are 88 firms represented in the above tallies.

The reported use of differing modes of transport mode according to linkages within the distribution system are shown in table 4-14. In general, these data indicate the dominance of the motor carrier at all stages. The use of other modes appears most significantly between processors and local markets, shown by the processor-wholesaler link. When air, rail, and ship are used, it is an indicator more of specific location and distances between stages than of factors characteristic of the stages per se. Alaskan processors usually move products by sea. The use of rail is also characteristic of older firms, and its use might be partially explained as a more traditional form of transportation. The use of motor carriers appears to be increasing at all levels in the channel.

Table 4-14

Modal Choice by Link in Channel

Link	No. of choices reported			
	Motor	Rail	Air	Ship
Receiving Station - Processor	15	1	1	2
Processor - Wholesaler	38	8	10	11
Wholesaler - Retailer	37	5	5	2

Source: Survey data

Confirmation is shown by data on the shift in transportation for the movement of salmon in the Chicago wholesale market over the period 1956 to 1966 (table 4-15). These data point out several trends, beginning with the decline in the total volume

Table 4-15

Deliveries of Salmon to the Chicago Wholesale Market by Transport Mode, 1956-1966 (1,000 pounds)

	Truck	%	Express	%	Freight	%	Total
1956	278.3	11.45	283.4	11.66	1,868.0	76.88	2,429.7
1957	269.1	10.81	108.6	4.37	2,111.2	84.82	2,488.8
1958	295.8	12.40	68.3	2.86	2,020.8	84.73	2,384.9
1959	155.0	8.16	38.6	2.03	1,705.5	89.81	1,899.1
1960	142.7	7.26	28.8	1.46	1,794.8	91.28	1,966.3
1961	326.4	16.58	63.6	3.23	1,578.7	80.19	1,968.7
1962	171.8	9.13	21.8	1.16	1,688.7	89.71	1,882.3
1963	281.5	20.97	19.0	1.42	1,041.8	77.61	1,342.3
1964	393.7	41.23	24.8	2.60	536.4	56.17	954.9
1965	390.3	27.49	24.3	1.71	1,005.3	70.80	1,419.9
1966	224.7	22.45	23.5	2.35	752.5	75.20	1,000.7

Source: Market News Service, Chicago Monthly Bulletin.

of salmon handled by the Chicago wholesale market, from 2.4 million pounds in 1956 to 1.0 million pounds by 1966. This would appear to reflect a changing institutional structure in the channel more than a decline in demand for salmon products per se, although this cannot be asserted with certainty. Change in the channel structure may influence the choice of modes, as receivers with newer facilities may prefer to deal with truckload as opposed to carload movements. During this period, the modal choice has effectively declined from three to two as REA Express traffic volume tended to disappear. While there is considerable fluctuation in the data, motor carriers have maintained an approximately constant volume in this declining market, increasing their share significantly since 1961. This in turn may reflect the improvements in the legal status of motor carriers carrying exempt products as a result of the Transportation Act of 1958.

Salmon movements to local markets were entirely by private truck, primarily those of either receiver or supplier. Other in-state movement was by truck, either privately owned or agricultural exempt for-hire carriers, or for some movements, by common carrier. Movement to West Coast markets in general was by exempt motor carrier, with some air shipments from Alaska and Seattle to San Francisco and Los Angeles. To the Midwest, fresh salmon move by truck or air, and to the East Coast, by air almost exclusively, while frozen salmon was shipped by either truck or rail. Export markets were served almost entirely by vessel.

The Fisheries Exemption for Motor Carriers

Almost all motor carriers moving in interstate commerce were operating under the Agricultural Exemption of the Motor Carrier Act of 1935,[21] and more recently the Transportation Act of 1958.[22] This exemption has been particularly effective in diverting traffic from the regulated to the nonregulated sector of the industry.[23] The salmon products under study clearly fall under this exemption and therefore almost all for-hire interstate truck services used in distribution were exempted from regulation. The only area of regulation was traffic moving entirely within an individual state, such as from Astoria to Portland, in Oregon.

Several different forms of operation were observed among these exempt firms. A few attempted to maintain schedules from Oregon and Washington to California, operating on what amounted to fixed routes, similar to common carrier operation, with rates readily quoted to interested potential shippers. Some carriers operated itinerant services on demand but with a reasonable degree

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[21] 49 U.S.C. 301, 49 Stat 543.

[22] PL 85-625 85th Congress, Second Session. Also see George Hilton, The Transportation Act of 1958 (Bloomington, Ind.; U. of Indiana Press, 1969), Ch. V, especially pp. 166-167.

[23] According to one survey of the impact of the exemption on the movement of fish, about two-thirds of the shipments of fresh and frozen fishery products in 1956 and 1958 were under the agricultural exemption. U.S. Bureau of Commercial Fisheries, Exempt Trucking of Fresh and Frozen Fish and Shellfish in Interstate Commerce, Circular 133 (Washington, D.C.; U.S. Government Printing Office, 1961), p. 10.

of reliability. Others were operating only for backhaul traffic, without effort to provide shippers with a regular service. The character of the fish transportation market has created a degree of specialization among carriers. Shippers within a given area could identify specific carriers who were actively engaged in this market, even though they were exempt from regulation. These carriers were more prominent in the minds of shippers than were the common carriers more familiar to the public at large.

For these exempt operations the market was coordinated in large part by truck brokers. These firms were, in our observation, one-man offices which arranged for exempt loads for truckers seeking return traffic. One that was interviewed maintained both a tariff and schedules, relying on a few clients to provide a consistent level of service. Another who charged substantially lower rates to shippers offered what appeared to be a lower level of service based on whatever itinerant trucking services were available. These brokers charged commission rates to the truck operators which varied from 8 to 10 percent of the truck revenue.

The role of the common carrier in the face of this lower-cost competition was that of a noncompetitive standby service, utilized whenever fishery exemption carriers were not available, or when the quantities offered were too small to tend to the exempt carriers. Several large common carriers operated agricultural exempt services, but these appeared to be rarely used

by shippers. The Pacific Inland Tariff Bureau, through its Tariff No. 79, attempted to offer lower-priced transport services on behalf of its participating member carriers, but this was almost universally regarded as a standby tariff, because of the higher price level. As a reflection on the noncompetitive role of the common carrier in this market, this tariff was cancelled in December 1969.

In summary, the lack of regulation has not reduced service in the transport market aside from eliminating services of regulated carriers which were priced above the market. While there has obviously been some distortion of markets because of elimination of a few services desired by shippers who were then forced to seek other markets, the general dissatisfaction on the part of shippers appears to be low, and the presence of the fishery exemption in motor carrier transportation has produced a quality of transportation which appears to be generally satisfactory, at prices under those which would have otherwise prevailed.

IV. Containers and Packaging

One of the major problems in the movement of fish to market is that of product handling. The problem differs between stages, the movement from receiving station to processor being different from the movement from processor to wholesaler, or from wholesaler to retailer. In general the problem of the first link is to move a large quantity with as little deterioration as possible for a relatively short distance geographically. The second customarily involves similar but frequently smaller quantities to

distant destinations by air, rail, truck, or sea; the wholesaler is concerned only about moving fish short distances, but in small quantities.

Tabular data from the project survey, as shown in table 4-16 were inconclusive in identifying a preferential container use by stage. Wood boxes of a maximum capacity of 100 to 200 pounds have been traditional in the industry and are commonly used between receiving station and processor for carrying iced fish. The tote box, moved by fork lift and carrying about 500 pounds at a time, is appearing more frequently at this stage, but not all receiving stations use fork lifts; and its penetration is limited. In our survey we also observed fish being transported on the floor of a refrigerated van, unboxed, restrained only by plywood barriers.

Table 4-16

Containers Used by Link in System

Type of Container	Receiving Station-Producer	Producer-Wholesaler	Wholesaler Retailer	Total
Wet lock	20.0	27.0	35.3	30.1
Fish box	13.3	6.0	-	4.1
Fibreboard	-	12.7	16.2	13.0
Wood Box	60.0	36.5	44.1	42.5
Waxed Carton	-	4.8	4.4	4.1
Totes	6.7	6.3	-	3.4
Container (Van)	-	6.3	-	2.7
	100.0	100.0	100.0	100.0
N =	15	63	68	146

Source: Survey data

For shipment from processor to wholesaler there was also a variety of containers. The wood box is used at this stage also, although it creates problems in returning empty boxes and sometimes adds 2 to 3 cents to the purchase price of the fish when the wholesaler is forced to buy them. Other containers include new forms such as the "wetlock," a fibreboard carton with a plastic lining, which will hold ice as well as fish, with a capacity of about 100 pounds. Several shippers have indicated that they have used it to carry fresh fish, particularly by air. Other containers include waxed fibreboard and styrofoam cartons, but the latter have only limited use. Prices charged by a major public warehouse for various packing containers are shown in table 4-17. Wood boxes are generally reused. One processor commented that they have a service life of approximately 5 years, which makes packaging costs a small part of the total. The problem of returns, however, has encouraged more use of non-reusable fibreboard containers.

Table 4-17

Comparable Prices for Wood and Fiberboard Containers
June 1969

Size	Price	Price/lb of Capacity
Cartons (incl. wire strap)		
50 lb cartons	$ .65	$.0130
125 lb cartons	1.00	.0080
200 lb waxed cartons	1.75	.0088
200 lb self-seal carton	2.20	.0110
300 lb self-seal carton	3.30	.0110
Wooden Boxes (incl. band, paper)		
100 lb wooden box	$2.00	$.0200
200 lb wooden box	2.90	.0145
300 lb wooden box	4.40	.0147
400 lb wooden box	5.50	.0138
500 lb wooden box	8.00	.0145

Source: Public Warehouse Tariff.

From wholesaler to retailer, the short trip duration and average shipment size have encouraged use of ordinary fibreboard cartons and, in one instance, a supermarket chain used plastic baskets. Some overseas buyers have insisted on individually wrapped fish, primarily for retail delivery. As a result, polyethelene bagging has been developed and used for this market.

A major problem in fish distribution is the multiple handling which takes place from receiver to retailer. In an ideal system, fish should never be rehandled from the time they are cleaned and dressed but should be carried in a single container to their ultimate destination. However, the sorting and grading problem has thus far precluded the use of efficient modular containers at the processor level.

V. Other Areas of Logistics Activity

Communication in the fish distribution industry has remained as an informal activity organized in domestic markets around the telephone, with documentation following the order but not usually initiating the sale. In overseas marketing, air mail letters and the use of teletype ensures a more consistent level of documentation. One large processor has commented that a major buyer had introduced computer ordering, and this was being extended to fish distribution only as a means of standardizing buying warehouse procedures.

In other countries, notably France, there has been some experimentation in electronic data market information systems.[24] From our observation during the survey, any effort to introduce a similar system into this channel would find the industry unprepared to utilize it.

Customarily in logistic systems, it is common to seek to apply computer-based quantitative decision rules for inventory such as economic order quantities and inventory safety stocks. Because of the nature of the commodity these have not been applicable to the fresh salmon portion of the industry. Further, there has been no indication of their use in the frozen salmon area.

Vehicle scheduling by computer at the wholesaler level was not encountered at any firm in the survey. As one wholesaler

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[24] Press release, March 10, 1969, Bull-General Electric, Paris.

explained, his ability to make day-to-day schedule changes was one of his most important competitive weapons. However, it should be noted that in Great Britain, the White Fish Authority has developed operations research techniques to handle this specific task.[25]

Problem Areas in Distribution

Physical distribution processes dominate the distribution channel for salmon. Whether the product is fresh or frozen, the decision choices for markets are determined in large measure by what is possible in moving products to market. There are several areas, however, where these choices may be unnecessarily constrained, and where further investment may be profitable.

Improved market information is a primary requirement. Despite a market reporting system described as "more intensely chronicled than in any other member [OECD] country,"[26] there is a large amount of risk present in every marketing decision. Because of the nature of the product market, there are few central markets for salmon, and price and quantity data appear only to be relevant to the local market area. The absence of immediate and widespread market information on prices and qualities makes decisions more uncertain than they would be otherwise. In turn, this has a limiting effect on product and market decisions.

25 White Fish Authority Research Bulletin No. 35, May 1969.

26 Organization for Economic Cooperation and Development, Price Systems at the Landing Stage in Fishing Industries of OECD Member Countries (Paris: OECD, 1966), p. 177.

Another information problem lies within the logistics system. The inability to control performance of the distribution system leads to perceptions of risk by sellers which also inhibit the free movement of fish products to market. One of the major problems in transporting fish is the lack of information both on carrier schedule performance and on quality of the product on arrival. The encouragement of carrier systems which will achieve sufficient market stability to encourage them to work closely with shippers and receivers would do much to eliminate a major market constraint.

The choice of product form is subject to constraints in the lack of cold storage capacity. The limited public warehouse capacity available in the salmon producing areas may force choices that would not otherwise be made, such as the decision to sell salmon as fresh rather than as frozen product because of the lack of storage capacity. The question that must be asked is whether the absence of adequate capacity results from the inadequacies of prospective returns, or merely from a lack of sufficient information on which to make rational decisions.

A final area where problems arise is in the multiple handlings which are necessary and which increase cost while lowering product quality. Multiple handling can only be reduced by considering the distribution system as a whole, rather than as fragmented units. In France, there has been a development in ready-boxed fish, where

fish are sorted and boxed on the deck of the vessel in sizes ready to go directly to the retailer without rehandling.[27]

The development of a modular unit handling system for salmon has been discouraged in part by the necessity to provide a sorting and grading function at an intermediate point. Given the present fishing technology, this would appear to be difficult, not only because of the grading system but also because of the lack of vessel space. To pursue the development of such a system ultimately leads to design of the vessel as part of a total delivery system. However, this would require extensive investment in vessels, which may not be forthcoming unless the returns are high; this in turn may require efficiencies elsewhere in the system in order to pass on higher prices to fishermen.

Summary

The physical distribution of salmon constitutes a large share of the activities involved in distribution. The organization and problem areas of the physical distribution channel, however, differ substantially from those of the exchange channel. Certain areas are unique to the physical distribution process such as the nature of channel control and coordination, the difficulties in evaluating performance, and the differences in objectives among component firms resulting from different technologies; these areas make the management of the physical distribution channel different from that of the exchange channel.

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[27] Ibid, p. 67.

1. Physical distribution involves two types of activities: holding as inventory and movement, both involving allocations of time and incurring costs including opportunity costs of the market. These allocations are distinctly different for fresh and frozen product forms, requiring different types of managerial decisions.

2. While the decision concerning product form is crucial to determining the physical distribution channel, the elements involved in this decision have thus far not been susceptible to statistical analysis.

3. The extent of the market for fresh salmon reflects the options presented by the transport system. Shipment by motor carrier limits movements to West Coast points only, while higher cost air freight permits movement to other markets such as the Midwest, East Coast, and recently into European markets.

4. Frozen salmon processing is limited by the availability of cold storage facilities, particularly in the originating area. However, once frozen, the product is free to move with far more flexibility than the fresh product, using transport modes emphasizing lower cost rather than transit times.

5. The motor carrier predominates as the major form of transportation in frozen domestic movement, having displaced both express and rail carload movements, even over long distances. In this survey, almost all motor carrier movements were made by

carriers operating under the Fisheries Exemption of the Transportation Act of 1958, rather than by common carrier.

6. There is little effort at standardization in container units, and multiple handlings were found to be a common practice in examining the total movement through the channel.

7. One of the major problem areas in salmon movement is the lack of information on market conditions, unnecessarily creating risk for both buyers and sellers in the market. Information is also lacking about the consistency of system performance on the delivery of fish to market.

While salmon obviously displays the characteristics of a system, there do not appear to be any visible efforts to manage the process as an integral unit. However this may not be possible today given the present lack of integration of the channel structure and the technological limitations of present day distribution.

APPENDIX TABLES
(Volume I)

Table A-1
World Commercial Pacific Salmon Catch
1956-67
(Millions of Pounds)
Round Weight

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
1/ Total Pacific Salmon Catch	1117.6	1140.2	1087.5	919.1	796.6	965.7	880.5	928.3	855.0	951.0	976.9	876.5
Chinook			44.1	44.3	38.0	38.5	38.8	41.1	49.6	46.6	47.5	45.7
Coho	315.8	301.1	78.2	62.0	45.0	67.7	83.8	90.8	100.0	98.4	94.9	77.3
Sockeye			201.4	124.2	187.6	227.9	144.3	104.8	118.5	229.3	173.0	155.4
Pink	434.8	577.1	438.2	424.9	247.0	393.5	361.7	461.4	317.3	354.7	385.5	370.5
Chum (also other)	366.9	262.1	325.6	263.8	279.1	238.0	251.8	230.0	270.0	222.1	276.0	226.7
2/ Japanese Pacific Salmon Catch	336.4	405.8	438.7	399.1	327.4	349.0	261.8	331.6	264.7	323.7	284.0	331.5
Chinook	0.9	0.2	0.8	1.1	2.2	1.0	2.4	1.5	4.4	2.0	2.7	2.1
Coho	19.9	2.1	24.6	13.6	12.7	9.4	18.7	20.9	27.6	15.9	10.4	8.6
Sockeye	44.3	93.8	56.6	43.5	67.2	80.9	55.2	42.0	31.5	55.2	35.7	45.3
Pink	158.0	211.5	202.0	223.4	134.0	167.3	88.0	165.5	85.8	146.3	102.0	154.5
Chum	113.3	98.2	154.8	117.5	111.3	90.4	97.5	101.7	115.4	104.3	132.2	120.1
3/ U. S. Pacific Salmon Catch	297.1	266.4	307.6	201.7	235.4	310.3	314.6	294.3	352.1	326.7	387.5	216.7
Chinook	38.4	28.2	27.6	27.5	24.0	26.9	25.1	27.2	28.8	29.3	27.3	26.2
Coho	29.1	22.9	23.3	20.2	13.7	23.2	27.7	28.1	38.1	38.5	38.7	38.3
Sockeye	86.6	76.9	67.8	53.8	95.4	103.5	58.0	43.4	57.2	148.0	102.0	66.0
Pink	88.2	73.2	120.9	61.8	52.6	108.4	143.3	156.6	162.3	79.7	163.0	51.7
Chum	54.7	65.3	67.9	38.5	49.8	48.1	60.4	38.8	66.1	31.3	56.5	34.5
4/ Canadian Pacific Salmon Catch	116.8	135.7	185.0	109.3	77.3	125.1	167.5	123.6	128.7	95.2	168.6	138.7
Chinook	13.7	12.7	14.2	13.5	10.3	9.1	9.1	10.2	13.3	12.7	15.3	15.4
Coho	25.2	22.8	24.7	19.6	14.2	24.7	26.6	25.5	31.7	36.7	38.7	22.5
Sockeye	21.5	15.7	74.1	18.1	15.5	26.6	20.1	11.9	23.0	16.2	25.7	37.1
Pink	29.0	57.3	33.9	35.0	17.0	50.1	93.6	60.6	36.8	22.9	73.5	51.6
Chum	27.4	27.2	38.1	23.1	20.3	14.6	18.1	15.4	23.9	6.7	15.4	12.1
5/ Russian Pacific Salmon Catch	367.3	332.3	156.2	209.0	156.5	181.3	136.6	178.8	109.5	205.4	136.8	189.6
Chinook			1.5	2.2	1.5	1.5	2.2	2.2	3.1	2.6	2.2	2.0
Coho	36.2	25.8	5.6	8.6	4.4	10.4	10.8	16.3	2.6	7.3	7.1	7.9
Sockeye			2.9	8.8	9.5	16.8	11.0	7.5	6.8	9.9	8.6	7.0
Pink	159.6	235.1	81.4	104.7	43.4	67.7	36.8	78.7	32.4	105.8	47.0	112.7
Chum (also other)	171.5	71.4	64.8	84.7	97.7	84.9	75.8	74.1	64.6	79.8	71.9	60.0

Sources

1/ Summation of sources 2/, 3/, 4/, and 5/.

2/ International North Pacific Fisheries Commission Statistical Yearbook. Summary Table V.

3/ Fishery Statistics of the United States U. S., Fish & Wildlife Service Statistical Digest. Section 12: Review of Pacific Coast Salmon Fishery.

4/ International North Pacific Fisheries Commission Summary Table II.

5/ FAO Yearbook of Fishery Statistics, Catches and Landings. Table B7-1 (Converted from metric tons (2,204.623 lbs)).

Table A-2

United States and Canada Commercial Pacific Salmon Catch

1956-1967

Millions of Pounds Round Weight

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967
1/ Total U. S Pacific Salmon Catch	297.1	266.4	307.6	201.7	235.4	310.3	314.6	294.3	352.1	326.7	387.5	206.4
Chinook	38.4	28.2	27.6	27.5	24.0	25.9	25.1	27.2	28.8	29.3	27.3	27.2
Coho	29.1	22.9	23.3	20.2	13.7	23.2	27.7	28.1	38.1	38.5	38.7	34.2
Sockeye	86.6	76.9	67.8	53.8	95.4	103.5	58.0	43.4	57.2	148.0	102.0	64.7
Pink	88.2	73.2	120.9	61.8	52.6	108.4	143.3	155.6	162.3	79.7	163.0	48.3
Chum	54.7	65.3	67.9	38.5	49.8	48.1	60.4	38.8	66.1	31.3	56.5	32.0
Alaska Pacific Salmon Catch	242.8	204.7	241.3	147.3	207.1	264.8	227.8	223.1	311.6	274.8	333.3	
Chinook	9.4	8.0	11.0	11.7	9.1	8.5	8.7	9.2	11.6	11.0	9.4	
Coho	12.8	10.6	13.1	11.9	9.6	11.4	15.2	17.6	21.0	17.7	16.1	
Sockeye	79.9	67.8	34.7	43.4	88.2	95.2	52.9	35.5	54.1	142.0	92.8	
Pink	88.2	55.6	120.7	48.0	52.6	103.5	143.3	125.1	162.3	74.9	162.9	
Chum	52.5	62.7	61.8	32.3	47.7	46.1	57.7	35.7	63.0	29.3	52.2	
Washington Pacific Salmon Catch	28.7	44.8	54.4	42.3	16.5	29.9	22.9	55.0	21.3	30.4	32.4	
Chinook	8.3	8.4	7.2	5.9	4.6	6.0	5.6	6.4	5.6	5.7	5.9	
Coho	11.7	7.7	8.4	6.6	2.9	8.7	9.5	6.1	9.4	12.1	12.8	
Sockeye	6.5	8.9	32.6	9.9	6.9	8.3	5.1	7.9	3.1	6.0	9.2	
Pink	-	17.5	-	13.7	-	4.9	-	31.5	-	4.6	.1	
Chum	2.2	2.4	6.1	6.2	2.1	2.0	2.7	3.1	3.1	2.0	4.3	
Oregon Pacific Salmon Catch	14.2	11.4	8.2	5.3	5.6	7.0	7.2	8.3	9.7	11.8	12.4	
Chinook	10.0	6.8	6.0	3.7	4.3	4.3	4.5	4.8	4.0	5.2	3.7	
Coho	3.9	4.1	1.5	1.1	1.0	2.6	2.6	3.4	5.8	6.4	8.7	
Sockeye	.2	.2	.5	.5	.3	.1	-	-	-	-	-	
Pink	-	.1	.2	.1	-	-	-	-	-	.2	-	
Chum	-	.2	-	-	-	-	-	-	-	-	-	
California Pacific Salmon Catch	11.4	5.5	3.7	6.8	6.2	8.6	6.7	7.9	9.5	9.7	9.4	
Chinook	10.7	5.0	3.4	6.2	6.0	8.1	6.3	6.8	7.6	7.4	8.3	
Coho	.7	.5	.3	.6	.2	.5	.4	1.0	1.9	2.3	1.1	
Sockeye	-	-	-	-	-	-	-	-	-	-	-	
Pink	-	-	-	-	-	-	-	-	-	-	-	
Chum	-	-	-	-	-	-	-	-	-	-	-	
Total Canadian Pacific Salmon Catch	116.8	135.7	185.0	109.3	77.3	125.1	167.5	123.6	128.7	95.2	168.6	138.7
Chinook	13.7	12.7	14.2	13.5	10.3	9.1	9.1	10.2	13.3	12.7	15.3	15.4
Coho	25.2	22.8	24.7	19.6	14.2	24.7	26.6	25.5	31.7	36.7	38.7	22.5
Sockeye	21.5	15.7	74.1	18.1	15.5	26.6	20.1	11.9	23.0	16.2	25.7	37.1
Pink	29.0	57.3	33.9	35.0	17.0	50.1	93.6	60.6	36.8	22.9	73.5	51.6
Chum	27.4	27.2	38.1	23.1	20.3	14.6	18.1	15.4	23.9	6.7	15.4	12.1

1/ Fishery Statistics of the United States, U. S Fish & Wildlife Service Statistical Digest Section 12, Review of Pacific Coast Salmon Fishery.

2/ B. C. Fishery Statistics and Internat'l N. Pacific Fisheries Comm. Statistical Yearbook Summary Table II.

Table A-3
Salmon Catch by Area, West Coast of North America
(Percent of Total Round Weight)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Total Catch	448, 482	405, 655	479, 116	313, 556	312, 800	435, 920	451, 994	417,602	490, 654	421, 978	427, 715
Chinook	51, 701	43, 241	41, 748	41, 347	35, 190	35, 957	34, 177	37, 344	41, 864	41, 989	41, 637
Coho	55, 088	49, 744	49, 644	40, 831	27, 899	47, 932	54, 362	53, 614	66, 315	75, 198	70, 123
British Columbia	26.0	33.4	38.6	34.9	24.7	28.7	37.0	29.6	26.2	22.6	39.4
Chinook	26.5	29.3	34.0	32.7	29.3	25.3	26.5	27.2	31.9	30.2	36.8
Coho	45.7	45.8	49.8	47.9	51.0	51.6	49.0	47.5	47.7	48.8	55.2
Southeastern Alaska	21.2	19.3	18.9	20.3	10.9	23.5	18.5	24.5	26.3	19.7	5.3
Chinook	9.3	13.9	15.6	17.6	16.6	8.3	11.0	12.0	15.4	12.9	10.8
Coho	15.0	22.0	17.1	22.6	19.0	16.3	17.6	21.1	14.3	18.1	9.5
Central Alaska	24.6	20.2	20.6	13.7	26.9	17.7	25.4	22.3	29.8	17.4	27.3
Chinook	3.3	2.8	2.2	2.3	2.4	1.8	2.5	1.9	1.1	1.6	1.3
Coho	8.6	5.9	8.3	7.3	13.7	6.1	9.0	10.2	11.2	4.9	6.3
Western Alaska	15.9	11.9	8.0	13.8	28.4	19.6	11.0	6.6	10.0	28.1	17.8
Chinook	5.1	7.3	8.7	9.4	9.2	13.7	12.0	10.6	10.8	11.7	9.9
Coho	1.2	1.6	3.5	1.7	1.6	1.4	1.4	1.6	1.0	.5	1.3
Puget Sound of Wash.	4.1	8.7	9.5	11.0	3.6	5.1	3.2	11.1	2.1	4.8	2.8
Chinook	5.4	9.6	6.9	7.1	5.9	7.1	5.8	7.3	5.6	5.6	4.8
Coho	13.7	8.4	11.8	10.0	4.9	10.7	10.2	5.7	7.9	7.6	4.9
Coastal Dist. of Wash.	1.6	1.6	1.2	1.7	1.0	1.3	1.2	1.4	1.0	1.4	1.6
Chinook	4.6	4.3	4.4	2.8	3.5	5.0	5.1	5.9	4.2	3.8	4.4
Coho	5.9	5.8	4.4	5.2	4.0	5.3	5.6	3.6	4.0	4.9	5.6
Columbia R. of Wash.	.9	.8	.7	.8	.6	.6	.6	.6	.6	1.1	.8
Chinook	5.9	5.5	5.7	4.3	3.8	4.3	5.4	3.9	3.6	4.3	3.2
Coho	1.5	1.3	.8	1.1	1.6	2.0	1.7	2.0	2.3	3.6	3.3
Columbia R. of Ore.	1.5	1.2	1.1	1.3	1.1	.9	1.1	1.0	1.1	1.7	1.7
Chinook	11.5	9.2	10.2	7.7	8.1	8.3	11.4	8.9	8.1	10.9	7.0
Coho	1.4	1.3	.6	.8	1.3	1.5	1.6	1.8	3.3	3.6	6.5
Coastal Dist. of Ore.	1.6	1.6	.6	.4	.7	.7	.5	.9	.9	1.1	1.1
Chinook	7.9	6.6	4.2	1.2	4.1	3.6	1.8	3.8	1.4	1.5	1.8
Coho	5.7	7.0	2.9	1.9	2.2	3.9	3.3	4.6	5.5	4.9	5.9
Northern California	1.4	.8	.3	.6	.8	.9	.9	.9	1.1	1.3	1.6
Chinook	11.3	6.9	3.5	4.1	6.6	10.2	11.2	7.9	9.6	9.9	14.6
Coho	.9	.6	.3	.4	.4	1.0	.7	1.5	2.1	1.8	1.2
San Francisco	.9	.4	.3	1.5	.9	.8	.5	.8	.7	.9	.5
Chinook	7.4	3.5	3.7	10.1	7.9	10.1	6.0	8.9	7.4	6.6	4.7
Coho	.5	.3	.3	1.0	.4	.1	.0	.3	.6	1.2	.4
Southern California	.2	.1	.1	.1	.3	.2	.1	.1	.1	.1	.1
Chinook	2.0	1.2	.9	.7	2.5	2.2	1.2	1.5	.7	1.1	.6
Coho	.0	.0		.1	.1	.1	.0	.0	.1	.2	.0

Table A-4
Salmon Troll Caught Salmon by Area, West Coast of North America
(Percent Pounds Troll Caught)

Troll % of total in areas	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	Total Ave.
British Columbia	19.6	19.4	11.6	22.8	21.0	19.6	15.0	23.5	24.4	35.8	23.7	11.0
Southeastern Alaska	8.4	16.4	11.3	18.4	22.3	6.0	10.5	10.8	9.8	13.7	41.1	12.4
Central Alaska	0	0	.4	.1	.1	.1	.1	.2	0	.1	0	.1
Western Alaska	0	.1	.1	.1	0	0	0	.1	0	0.	.1	.04
Puget Sound of Wash.	25.1	17.3	10.4	13.0	11.6	14.3	18.5	9.4	25.3	15.3	17.6	14.5
Coastal Dist. of Wash.	54.2	64.6	50.2	44.4	42.9	53.1	62.3	73.1	56.5	68.2	68.0	58.9
Columbia R. of Wash.	23.6	20.5	14.8	21.5	26.9	40.0	32.2	46.7	43.3	53.4	48.5	34.7
Columbia R. of Ore.	13.8	15.1	5.7	7.6	9.3	14.4	9.8	16.8	13.2	17.2	15.7	13.0
Coastal Dist. of Ore.	90.2	97.6	94.9	92.0	98.4	98.7	100.0	100.0	100.0	100.0	100.0	97.2
Northern California	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	99.9	99.9	99.9	99.9
San Francisco	72.1	80.3	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	95.6
Southern California	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Table A-5

Estimated Current Additions to the Supply of Fresh and Frozen Salmon (In thousands of lbs)

Total Production and Imports	1956		1957		1958		1959		1960	
	Production	Imports	Production	Imports	Production	Imports	Production	Imports	Production	Imports
United States										
Fresh	9,955	5,952	10,545	8,598	9,138	15,212	730	10,362	6,954	6,173
Frozen	9,372	6,988	3,461	7,079	6,028	10,968	4,096	9,338	1,919	7,299
Canned	167,858	28,802	153,548	24,401	178,831	29,226	117,855	31,154	135,753	19,113
Cured	11,795	48	11,017	103	11,595	77	11,323	54	12,207	56
Canada										
Fresh	12,342	1,764	14,599	1,102	23,557	882	15,932	661	13,471	661
Frozen	15,165	--	9,222	--	18,985	--	10,205	--	13,989	--
Canned	51,069	9,480	68,316	2,425	91,151	1,984	51,659	--	30,242	1,373
Cured	2,080	--	962	--	1,093	--	1,016	--	788	--
Japan										
Fresh	--	--	--	--	--	--	--	--	--	--
Frozen	1,323	--	6,173	--	13,007	--	3,086	--	4,850	--
Canned	93,256	--	69,005	--	123,679	--	137,128	--	82,673	--
Cured	--	--	--	--	--	--	--	--	--	--
1/ Unspecified dress wt. for domestic consumption	243,844	--	309,920	--	264,910	--	380,965	--	215,075	--
Russia										
Canned	8,818	--	7,937	--	5,512	--	10,141	--	5,291	--
1/ Unspecified dress wt. for domestic consumption	304,415	--	275,460	--	127,167	--	166,557	--	127,712	--

Continued

Table A-5 Continued

Total Production and Imports	1961		1962		1963		1964		1965	
	Production	Imports	Production	Imports	Production	Imports	Production	Imports	Production	Imports
United States										
Fresh	14,731	4,850	8,368	2,866	21,975	3,086	39,990	1,984	28,806	1,543
Frozen	4,529	7,459	6,950	6,869	15,592	5,812	10,690	6,834	5,365	6,318
Canned	177,115	7,167	182,157	6,843	157,786	1,249	180,302	236	74,233	101
Cured	12,597	41	11,823	64	8,441	135	11,365	105	13,419	130
Canada										
Fresh	9,668	441	9,667	441	8,368	1,323	8,026	1,323	5,683	882
Frozen	11,261	--	15,277	--	17,808	--	23,830	--	19,096	1,543
Canned	67,401	1,102	87,157	661	57,722	1,543	60,194	220	43,829	1,543
Cured	789	--	742	--	601	--	877	--	883	--
Japan										
Fresh	--	--	--	--	--	--	--	16,094	--	--
Frozen	2,646	--	2,425	--	2,646	--	3,086	--	882	1,323
Canned	58,863	--	121,695	--	65,698	--	61,950	--	83,114	--
Cured	--	--	--	--	--	--	--	--	--	--
1/ Unspecified dress wt. for domestic consumption	269,832	--	101,171	--	243,547	--	181,079	--	214,770	--
Russia										
Canned	8,157	--	9,259	--	9,039	--	7,055	--	7,937	--
1/ Unspecified dress wt. for domestic consumption	145,314	--	105,439	--	142,017	--	84,998	--	166,326	--

Continued

Table A-5 Continued

Total Production and Imports	1966 Production	1966 Imports	1967 Production	1967 Imports
United States				
Fresh	26,046	1,764	20,498	--
Frozen	15,703	6,532	10,768	--
Canned	209,023	589	99,374	121
Cured	12,569	131	12,327	60
Canada				
Fresh	7,118	1,323	5,372	--
Frozen	23,772	2,425	23,049	--
Canned	87,263	2,205	70,292	--
Cured	790	--	1,027	--
Japan				
Fresh	--	--	--	--
Frozen	441	2,425	--	--
Canned	50,486	--	--	--
Cured	--	--	--	--
1/ Unspecified dress wt. for domestic consumption	217,927	--	--	--
Russia				
Canned	7,937	--	--	--
1/ Unspecified dress wt. for domestic consumption	107,330	--	--	--

1/ Primarily used for cured salmon product. Only products which are exported can be identified as to product form. Product form of domestic consumption is not specified.

Table A-6

Consumption of Salmon by Country by Product Form (Thousands of pounds)

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
United States											
Fresh	14,143	17,467	23,248	9,549	10,261	18,479	9,691	20,211	19,414	29,026	25,385
Frozen	16,360	10,540	16,996	13,434	9,218	11,988	13,819	21,404	17,524	2,447	4,815
Canned	191,447	171,261	198,779	135,158	142,936	176,492	180,017	148,807	159,602	49,434	189,128
Cured	11,207	10,767	11,177	10,885	11,732	11,997	11,318	7,999	10,464	13,549	12,700
TOTAL	233,157	210,035	250,200	169,026	174,147	218,956	214,845	198,421	207,004	94,456	232,028
Canada											
Fresh	8,154	7,103	9,227	6,231	7,959	5,259	7,242	6,605	7,365	5,022	6,677
Frozen	7,669	1,506	7,300	505	4,068	1,561	4,033	4,801	7,075	3,884	5,914
Canned	28,362	46,711	31,846	17,487	15,962	49,984	64,229	25,534	20,731	18,917	63,894
Cured	2,032	859	1,016	962	732	748	678	466	772	753	659
TOTAL	46,217	56,179	49,389	25,185	28,721	57,552	76,182	37,406	35,943	28,576	77,144
Japan											
Fresh									16,094		
Frozen	0	0	0	0	0	0	0	0	0	0	0
Canned											
Unspecified	243,844	309,920	264,910	380,965	215,075	269,832	101,171	243,547	181,079	214,770	217,927
TOTAL	243,844	309,920	264,910	380,965	215,075	269,832	101,171	243,547	197,173	214,770	217,927
U.S.S.R.											
Canned	0	0	0	0	0	0	0	0	0	0	0
Unspecified	304,415	275,460	127,167	166,557	127,712	145,314	105,439	142,017	84,998	166,326	107,330
TOTAL	304,415	275,460	127,167	166,557	127,712	145,314	105,439	142,017	84,998	166,326	107,330
United Kingdom											
Fresh				220	220	220	220	1,543	2,205		661
Frozen	1,102	5,953	12,787	3,086	4,850	3,968	4,630	4,850	6,834	7,055	10,362
Canned	48,502	46,077	128,530	109,790	67,461	49,163	121,916	73,855	82,012	94,358	62,611
TOTAL	49,604	52,030	141,317	113,096	72,351	53,351	126,766	80,248	91,051	101,413	73,634
France											
Fresh				220	661	220	661	1,543	2,205		
Frozen			221	1,102	2,646	1,102	1,984	3,748	4,850	6,614	10,803
Canned	1,543	441		2,646	1,102	2,205	1,984	5,071	3,527	3,307	3,086
TOTAL	1,543	441	221	3,968	4,409	3,527	4,629	10,362	10,582	9,921	13,889
Sweden-Frozen										882	1,543
Italy-Canned	1,102	1,543	1,764	1,102	882	882	882	1,984	1,323	661	1,323
Ireland	882	661	882	1,323	882	882	1,323	221	441	441	223
Netherlands-Canned	5,291	3,748	4,409	7,275	3,527	5,291	3,748	221	221	221	221
Belgium & Luxumbourg-Canned	11,244	5,512	6,614	9,259	5,723	5,512	4,409	5,952	8,819	7,555	5,732

Continued

Table A-6 Continued

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
Australia	5,291	6,173	7,496	8,157	7,716	9,259	8,157	9,480	12,346	11,685	11,464
New Zealand	4,630	3,307	2,866	1,761	3,748	1,984	1,543	2,425	2,646	2,866	1,764
Philippines	2,425	2,425	1.764	4,189	661			221			
Other	2,648	3,749	3,308	3,748	2,867	2,647	11,025	10,363	10,363	11,246	9,040
Total Fresh	22,297	24,570	32,475	16,220	19,101	24,170	17,814	29,907	47,283	34,048	35,723
Frozen	25,137	17,999	37,304	18,127	20,782	18,619	24,466	34,803	36,238	20,882	44,240
Canned	303,367	291,608	388,258	149,253	253,467	304,301	348,146	284,183	302,031	201,573	348,486
Cured	13,239	11,626	12,193	11,047	12,464	12,745	11,996	8,465	11,236	14,302	13,359
Unspecified	548,259	585,380	392,077	547,522	342,787	415,146	206,610	385,564	266,077	381,096	325,257
GRAND TOTAL	910,299	931,183	862,307	742,269	648,601	774,981	629,032	742,917	662,910	651,901	764,065
GRAND TOTAL UNSPECIFIED	362,040	345,803	470,230	194,747	305,814	359,835	402,422	357,353	396,833	270,805	438,808

Table A-7
Relative Salmon Product Consumption by Country, 1956-66

	1956	1957	1958	1959	1960	1961	1962	1963	1964	1965	1966
World total, all products											
Fresh-Total	2.4	2.6	3.8	2.2	2.9	3.1	2.8	4.0	7.1	5.2	4.3
Frozen	2.7	1.9	4.3	2.4	3.2	2.4	3.9	4.6	5.5	3.2	5.8
Canned	33.3	41.6	45.0	20.1	39.1	39.3	55.4	38.2	45.6	30.9	45.6
Cured	1.4	1.2	1.4	1.5	2.0	1.6	1.9	1.1	1.7	2.2	1.7
Unspecified	60.0	62.8	45.5	73.8	52.9	53.6	32.8	51.8	40.1	58.5	42.6
World total, product form identified											
Fresh	6.2	7.1	6.9	8.2	5.3	6.7	4.4	8.4	11.9	12.6	7.4
Frozen	6.9	5.2	7.9	9.3	6.8	5.2	6.1	9.7	9.1	7.7	10.1
Canned	83.8	84.3	82.6	82.0	82.9	84.6	86.5	79.5	76.1	74.4	79.4
Cured	3.7	3.4	2.6	5.7	4.1	3.5	3.0	2.4	2.8	5.3	3.0
Fresh & Frozen %	13.1	12.3	14.8	17.5	12.1	11.9	10.5	18.1	21.0	20.3	17.5
United States											
Fresh	6.1	8.3	0.2	5.6	5.9	8.4	4.5	10.2	9.4	30.7	10.9
Frozen	7.0	5.0	6.8	7.9	5.3	5.5	6.4	10.8	8.5	2.6	2.1
Canned	82.2	81.5	79.0	80.2	82.0	80.7	83.8	75.0	77.2	52.3	81.7
Cured	4.8	5.1	4.4	6.4	6.8	5.5	5.3	4.0	5.0	14.3	5.5
Fresh & Frozen	13.1	13.3	16.0	13.5	11.2	13.9	10.9	21.0	17.9	33.3	13.0
Canada											
Fresh	17.6	12.6	18.9	24.6	27.8	9.1	9.5	17.7	20.3	17.6	8.6
Frozen	16.6	2.7	14.9	2.5	14.2	2.7	5.3	12.8	19.7	13.6	7.7
Canned	61.4	83.7	64.5	68.9	55.7	86.7	84.2	68.3	57.7	66.3	82.6
Cured	4.3	1.5	2.4	3.8	2.6	1.3	1.1	1.2	2.2	2.6	8.5
Fresh & Frozen	34.2	15.3	33.6	27.1	42.0	11.8	14.8	39.5	40.0	31.2	25.3
United Kingdom											
Canned %	97.7	88.7	91.1	96.9	94.5	92.2	96.3	92.0	90.2	93.2	85.1
France											
Canned %	100.0	100.0	0	53.5	25.0	62.6	42.9	49.0	33.4	32.4	22.2

Appendix Table B-1

Volume, Revenues and Average Prices, 1965

Area	Chinook	Coho	Sockeye	Pink	Chum
Pounds (dry weight)					
Alaska	9,578	15,369	123,571	65,139	25,458
B. C.	10,847	31,440	14,111	19,921	5,790
Washington except Columbia	3,465	10,086	5,216	3,960	1,736
Columbia River Washington	1,482	336	12		2
Columbia River Oregon	3,894	1,328	9		3
Oregon except Columbia	567	4,204		189	
California	8,102	1,571		64	
TOTAL	37,933	64,336	142,918	89,272	32,990
$					
Alaska	$ 3,405	$ 3,451	$30,784	$ 7,684	$ 2,377
B. C.	5,306	11,107	6,015	2,668	824
Washington except Columbia R.	1,484	3,298	2,037	580	421
Washington Columbia R. only	475	77	5		(.2)
Oregon Columbia R. only	1,452	329	3		1(.6)
Oregon except Columbia R.	317	1,681		40	
California	4,384	581		24	
TOTAL	$16,039	$19,634	$38,363	$10,782	$ 3,557
¢/lb.					
Alaska	36¢	23¢	25¢	11.7¢	9¢
B. C.	53¢	36¢	43¢	13¢	14¢
Washington except Columbia R.	43¢	32¢	39¢	15¢	24¢
Washington Columbia R. only	32¢	23¢	42¢		9¢
Oregon Columbia R. only	37¢	25¢	33¢		20¢
Oregon except Columbia R.	54¢	40¢		21¢	
California	54¢	37¢		37¢	
Ave.	43¢	31¢	27¢	12¢	11¢

Appendix Table B-2

Seattle and Alaska Salmon Prices

	April	May	June	July	August	September	October
Seattle			1956				
Ch. R. Lge		47-58	46.5-55	51-61	51-60	52-56	
Med		41-49	41-47.5	41-53	41-58	41-44	
Silver		--	--	34-39	38-40	38	
Juneau Ch. R. Med			38-40	40-45	45-48	46	
			Large	Large	Large	Large	
Pelican							
Petersburg							
Wrangell							
Juneau Silver							
			1957				
Ch. R. Lge	48-53	44-49	41.5-46.5	48-52	45-49	49-59	
Med	43-48	36-41	34-39.5	36-39	34-39	27-35	
Silver			--	30-31	28-31	32-35	
Juneau Ch. R. Med			26-32	32	32-33	33	
Pelican			"	"	"	"	
Petersburg			27-32	"	"	"	
Wrangell			"	"	"	"	
Juneau Silver							
			1958				
Ch. R. Lge	77	61-67	65-68	73-89	74-84	77-80	76
R. Med	77	47-59	48-52	46-54	46-50	45-47	46
Silver		--	28-41	34-39	41-45	41-46	45
Juneau Ch. R. Med		33-35	35-37	38	38		
Pelican		35	"	38	"		
Petersburg		33-35	"	37-38	"		
Wrangell		"	"	37-38	"		
Juneau Silver		--	--	22-27	27-28		
			1959				
Ch. R. Lge	67.5-69.5	67-71.5	62-69.5	63-69	59-60	61-73	61-65
R. Med	67.5-69.5	43-45	44-46	46-48	46-46.5	49-54	51-53
Silver			31-33	34-36.5	34	39-41.5	50-54
Juneau Ch. R. Med		29	29	29-30	30		
Pelican		29	29	"	30		
Petersburg		30	30	30-31	31		
Wrangell		30	30	"	31		
Juneau Silver		--	--	20-23	28-31		

Continued on next page

Appendix Table B-2 Continued

	April	May	June	July	August	September	October
Seattle				1960			
Ch. R. Lge		66-68	69-71	69-77	73-78.5	81-85	83-84
R. Med		58-61	53-57	56-63	56-58	61-67	56-58
Silver		--	31-45	46-49	52-57	55.5-56.5	57-58
Juneau Ch. R. Med		29	31-32	32	32-40		
Pelican		"	"	"	"		
Petersburg		"	"	"	"		
Wrangell		"	"	"	"		
Juneau Silver		--	--	23-30	35-44		
				1961			
Ch. R. Lge	74-77	69-83	74.5-81	70.5-73	71-81	77-79	76
R. Med	61-62	56-61.5	56-60	56	56-58	56-58	56
Silver	--	--	31	36-39	38.5-41	44-46	50
Juneau Ch. R. Med		32	32	32-35	35		
Pelican		"	"	"	"		
Petersburg		"	"	"	"		
Wrangell		"	"	"	"		
Juneau Silver		--	20	20-25	25-32		
				1962			
Ch. R. Lge	73-82.5	75-79	77-78	80-94	80-1.01	77-79	
R. Med	73-76	56-61	56	56-58	56-61	56-58	
Silver	--	--	--	37.5-41.5	41-46	44-46	
Juneau Ch. R. Med		35	35-40	40	40		
Pelican		"	"	"	40		
Petersburg		"	"	"	40		
Wrangell		"	"	"	40		
Juneau Silver		--	25	20-25	30-38		
				1963			
Ch. R. Lge	78-82.5	70-75	74	80	80	80-81	
R. Med	61-65.5	60-65	53	55-56	55-58	57-59	
Silver		--	--	36.5-38	42-43	45-46	
Juneau Ch. R. Med			35	35	35		
Pelican			"	"	--		
Petersburg			"	"	35		
Wrangell			"	"	35		
Juneau Silver			17-23	17-27	21-30		

Continued on next page

Appendix Table B-2 Continued

	April	May	June	July	August	September	October
Seattle			1964				
Ch. R. Lge		80	78-80	80-83	80-83	77-80	
R. Med		62	60-62	55-62	60-62	58-60	
Silver		--	40-42	43-45	46-47	46-47	
Juneau Ch. R. Med		35	35	35	35	35	
Pelican		"	"	35	35		
Petersburg		"	"	35	35		
Wrangell		"	"	35	35		
Juneau Silver		--	25	25-31	31-34		
			1965				
Ch. R. Lge	--	73	73	73	73	70-76	
R. Med	--	60	60	60	70	60	
Silver	--	--	41	43	43-46	43-46	
Juneau Ch. R. Med		35	35	40-45	45		
Pelican		"	"	40-45	45		
Petersburg		"	"	40-45	45		
Wrangell		"	"	40-45	45		
Juneau Silver		--	22	22-32	34		
			1966				
Ch. R. Lge		65	71	71	N.A.	73-75	74
R. Med		50	56	55-56	"	56-60	58
Silver		--	41	40-41	"	46-48	48
Juneau Ch. R. Med		35	35	35	35		
Pelican		35	35	35	35		
Petersburg		35	35	35	35		
Wrangell		35	35	35	35		
Juneau Silver		20	25	25-34	34-35		
			1967				
Ch. R. Lge	78	78	78	78	78	78-80	78
R. Med	63	63	63	63	63	63	63
Silver	--	--	--	48-51	56	54	56
Juneau Ch. R. Med		35-40	35-37	37-40	40		
Pelican		30-35	35-37	37-40	40		
Petersburg		35	35-40	40	40		
Wrangell		35	35-40	37-40	40		
Juneau Silver		20	25-27	27-38	38-43		

Continued on next page

Appendix Table B-2 Continued

	April	May	June	July	August	September	October
Seattle				1968			
Ch. R. Lge	83	83	83	86	89	89	89
R. Med	68	68	68	71	71	71	71
Silver	--	--	51	54	56	58	58
Juneau Ch. R. Med		40	40	40-45	45	45	--
Pelican		40	40	40-45	45	45	--
Petersburg		40	45	40-45	45	45	--
Wrangell		40	45	45	45	--	--
Juneau Silver		20-25	30	35-41	38-47	47-52	--
				1969			
Ch. R. Lge	89	89	89	89	91		
R. Med	72	72	72	72	74		
Silver	60	--	53	56	62		
Juneau Ch. R. Med		45	45	45	45-47		
Pelican		45	45	45	45		
Petersburg		40-45	45-48	45	45-50		
Wrangell		45-48	45-48	45-48	45-47		
Juneau Silver		25	35	35-45	45-55		

Source: Washington and Alaska Receipts and Landings, Monthly Summary Market News Service, Seattle.

Appendix Table B-3

Chicago Salmon Prices by Month, 1957-1968.
(cents/pound)

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
						1957						
Chinook Med	58	55-58	55-58	55-56	46	45	--	--	53	53	53	53
Coho Large	50-54	49-56	45-50	45-47	40-47	40-42	40-45	43-45	43-46	45-48	46-48	46-48
	.622	.621	.611	.598	.575	.564	.572	.573	.560	.560	.557	.557
						1958						
Chinook Med	53-54	53-54	53	--	--	62-63	60-65	60-65	60-65	60-65	60	60
Coho Large	47-52	50-52	50-52	51-54	52-54	--	53-55	55-58	56-58	56-58	56-58	55-57
						1959						
Chinook Med	58-60	58-60	--	--	--	--	--	44	44-50	50-55	55	58
Coho Large	54-57	52-55	49-54	46-50	44-48	44-48	48-50	48-50	56-58	58-60	59-60	59-62
						1960						
Chinook Med	38				73	68-69	76	75-78	76		80	85-89
Coho Large	59-62	60-62	62-65	64-65	--	--	65-70	68-70	69-75	70-76	73-76	73-75
						1961						
Chinook Med	83-85	79-83	79-80	--	--	--	--	--	--	--	--	74
Coho Large	73-75	68-76	60-68	58-60	58-60	55-56	55	55-60	55-60	60	60	60

Continued on next page

Appendix Table B-3 Continued

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Chicago						1962						
Chinook Med	74	74	74	74	74-76	74-75	74-75	74	73-75	--	74	74
Coho Large	60	58-60	58-60	56-60	55-60	57-60	57-60	58-60	60-62	58-62	57-60	57-60
						1963						
Chinook Med	74	74	74	74	74	74	70	70	70	70	70	70
Coho Large	57-60	57-60	55-60	53-58	50-55	53-57	54-57	53-56	53-56	55-60	55-57	56-60
						1964						
Chinook Med	70	70	70	70	70	70-72	72	72	72	72	70-72	70-72
Coho Large	57-60	56-60	57-58	56-58	55-60	55-60	60	58-61	60-65	60-62	61-63	60-63
						1965						
Chinook Med	71-72	71-72	71-76	71-72	70-72	70-72	70-72	70-72	71-73	71-72	71-72	71-72
Coho Large	59-61	58-61	58-60	57-60	57-60	54-57	55-58	58-59	60-62	59-61	59-60	59-60
						1966						
Chinook Med	71-72	71-72	71-76	72	72	72-75	72-75	72-75	72-75	75-80	75-80	75-80
Coho Large	58-60	58-60	58-62	60-62	--	--	64-65	64-65	64-65	64-65	64-67	64-67
						1967						
Chinook Med	75-80	75-80	75-80	75-80	75-80	--	85	85	85	85	85	85
Coho Large	66-67	65-67	65-67	67-70	68-70	70	75	78	78	80	80	80
						1968						
Chinook Med	85	85	--	--	--	--	--	95	--	95	95	95
Coho Large	77-80	78-80	78-83	80-83	78-83	78-80	80	78-80	78-81	79-81	80-86	80-86

Appendix Table B-4

New York Salmon Prices

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
						1956						
F. Red King Lge				63-100	60-70	63-70	60-68	65-68	55-75	55-75	70-80	85
Med				60-62	53-65	53-65	58-65	60-65	58-65	60-65	68-70	--
						1957						
F. Red King Lge						N. A.						
Med						N. A.						
						1958						
F. Silver Lge												
F. Red King Lge								80-85	70-85	60-90		
Med								70-80	70-75	75		
Fzn. Silver Lge	52-58	52-55	50-52	52-55	52-55	--	--	60	60-68	60	60-65	59-63
Red King Lge	70-72	70-72	70-76	72-75	73-75	--	80	80	80-85	85-90	85-90	85-90
Med	50-55	50-55	58-60	58-67	65	--	70	70-75	70-75	70-75	65-70	65-70
						1959						
F. Silver Lge												
F. Red King Lge					75-85	70-85	70-85	75-85	70-90	85-90		
Med					70-78	60-75	67-75	75-80	65-80	75-85		
Fzn. Silver Lge	58-60	54-60	55-57	50-55	50-55	50-55	50-55	53-55	53-60	58-60	58-63	60-64
Red King Lge	85-90	85-90	85-90	85-90	85-90	85-90	85-90	85	80-85	85	85	85-86
Med	65-72	60-65	60-65	60-65	60-65	60-65	60-65	55-65	55-60	58-63	58-70	65-70
						1960						
F. Red												
F. Red King Lge						87-90	85-95	70-98	75-1.05	95-1.10		
Med												
Fzn. Silver Lge	61-65	62-65	62-68	65-70	65-70	--	--	--	--	--	--	--
Fzn. Red King Med	60-86	60-86	66-88	65-85	70-90	65-90	70-95	75-95	75-95	75-95	75-95	75-95

Continued on next page

Appendix Table B-4 Continued

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1961												
F. Red King Lge			110-115	--	90-95	80-95	90	85-95	--	--	--	--
Med					80-85	82-85	82-85	80-85				
Fm. Silver Lge							65	65-70	70	70	70	70
Fm. Red King Med	75-1.00	70-1.00	60-1.00	70-1.00	60-1.00	60-95	60-93	60-95	60-95	65-96	65-1.00	65-1.(
1962												
F. Silver												
F. Red King Lge					96	96	98	98	104			
Med												
Fm. Silver Lge	70	62-65	63-65	63-65	63-65	63-70	70-75	75	--	--	--	--
Fm. Red King Lge	95-1.00	95-1.00	95-1.00	95-1.00	95-1.00	--	1.05-1.07	1.05-1.10	1.10	1.10	1.10	1.10
Med	75-80	75	75	75	70-75	70-75	83-85	83-85	80-85	80-85	80-85	80-85
1963												
F. Silver												
F. Red King Lge					91	84	89	85	90	75	88	--
Med												
Fm. Silver Lge	--	--	--	58-60	57-60	60-62	60-62	60-62	61-63	63-65	65	67
Fm. Red King Lge	1.10	1.05-1.10	1.00-1.10	95-1.00	95-1.00	--	92-95	95-97	97-1.00	1.00-1.05	1.00-1.05	96-1.
Med	80-85	80-33	75-85	75-80	75-80	65-90	70-75	70-72	70-75	70-75	70-75	70-75
1964												
F. Silver Lge								65-85	65-90	50-80	70-85	75-1.
King Lge				75-1.20	63-1.20	65-1.05	70-1.01	70-1.10	70-1.10	75-1.00		
King Med												
Fm. Silver Lge	65-67	65-67	63-67	63-67	65-67	67-68	68	68-70	68-70	68	68	68
King Lge	95-98	95-98	95-98	95-98	95-98	95-98	95-1.00	95-1.00	95-97	93-97	90-95	90-95
King Med	67-75	65-72	65-70	67-72	67-72	70-73	72-73	70-73	70-73	70-75	70-73	70-73

Continued on next page

Appendix Table B-4 Continued

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
						1965						
F. Silver Lge												
King Lge					70-1.05	65-1.05	60-1.00	60-1.05	60-1.10	65-1.10	1.00-1.20	
King Med												
Fzn. Silv. Lge	67-68	67-68	--	--	--	--	68	68	68	70	70	70
King Lge	95-1.00	95-1.00	90-1.00	90-95	90-95	90-95	1.02	97-1.02	--	93-95	--	--
King Med	72-73	72-73	72-73	72-73	72-73	72-73	72-73	75	75	72-75	75	75
						1966						
Fr. Silver Lge												
King Lge			1.10-1.25		60-1.15	73-1.05	.75-1.10	.65-1.10	.70-1.10	.80-1.10		
King Med												
Fzn. Silver Lge	--	--	68-70	68-70	67-70	67-69	76-78	73-75	70-73	72-78	72-75	72-75
King Lge	--	--	1.00	--	--	--	--	95	95	92-95	95	95
King Med	75	72-75	70-75	70-75	68-73	68-73	75-78	75-78	75	75-78	76-78	80
						1967						
Fr. Silver Lge							73-88	70-95	70-95	75-90		
King Lge				85-135	70-110	75-110	73-110	80-112	90-115	90-120		
King Med												
Fzn. Silver Lge	73-74	70-75	70-73	70-76	76	76	--	90	90	--	86-88	85-90
King Lge	95	95	95	95	--	--	--	--	--	--	102-103	98-103
King Med	75-80	75-80	75-80	75-80	75-80	--	--	93-95	93-95	--	85-89	85-89
						1968						
Fr. Silver Lge							80-1.05	88-1.10		85-90	90-1.00	90-1.0
Red King Lge	--	1.35-1.50	1.30-1.45	90-1.25	80-1.25	80-1.20	80-1.20	90-1.40	85-1.30	85-1.30	--	--
Med												
Fzn. Silver Lge	85-92	90	85-92	85-90	87-90	87	87	87	87	87-90	80-90	85-90
King Lge	85-1.05	90-1.04	90-1.01	90-1.05	85-1.10	85-1.10	85-1.10	90-1.15	.95-1.15	95	95	95-1.0
Med												

Continued on next page

Appendix Table B-4 Continued

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec
						1969						
Fr. Silver Lge							95-1.00	78-95				
Red King Lge	--	--	--	95-1.35	90-1.35	85-1.30	85-1.35	85-1.25				
Med												
Fm. Silver Lge	125-130	125-130	125-130	125-130	125-130	125-130						
King Lge	82-95	95	90-95	90-95	90-95	90-95						
Med	105-110	105-110	105-110	105-110	105-110	105-110						

Appendix B-5

Procedure for Development of Data for Figure 1

1. Survey data for each state were combined to derive an estimate of the percentage distribution by destination market areas. This estimate combined individual estimates by local processors of their geographic distribution and then extrapolated them to a state-wide total using dressed weight as the physical unit of measure. The state was used as a unit because hopefully errors of estimation for smaller areas could be diminished, although not eliminated, in a more aggregative form. In addition, because a large producer within a given local area would dominate the area data, it would be impossible to avoid disclosure, a problem we wished to eliminate if possible. The state was the smallest political unit for which aggregate data would be readily available in published form as a base for projection. The geographic distributions by state of origin are shown in Table B-6.

2. The net domestic supply was calculated for each state-wide area, taking the total chinook and coho catch, converting from round to dressed weight, and eliminating canned volumes of these species, taking allowance for the differences in recovery of fresh and frozen versus frozen. In this estimate, fresh and frozen were assumed to equal 85 percent of total: for canned weight, the percentage was reduced to 60 percent. The net total

thus derived then became an estimated total production volume in market forms other than canned, establishing the total supply in the market. One further step was to eliminate the volume of locally produced mild-cured salmon which absorbs some of the fresh and frozen supply.

3. Export volumes by Customs District (See Table 3-5 in Chapter III) were subtracted from total state volume to provide total estimates of domestic product. In addition, estimates of imports from Canada by customs district, principally through Seattle, were added to provide an estimate of total volume moving in domestic markets. Data were not available for imports through other customs districts.

4. The percentages of distribution by state area in Step 1 were then applied to the state totals and then the net of canned and mild-cured volumes to provide estimates of volume moving to specific destination market areas. The calculations are shown in Appendix Table B-7.

Table B-6

Distribution of Fresh and Frozen Salmon by Area of Origin--Domestic Movement
(% of total in each area)

Area	Destination: Seattle	Other Wash.	Portland	Other Oregon	San Francisco	Los Angeles	Other Calif.	M.W.	E.C.
Alaska	96.5%					3.5%			
Washington	26.3 27.4	1.1	0.6	--	6.5	8.9	0.3	23.1	32.8
Oregon	18.9 19		5.5	2.5	6.0	18.0	28.6	5.4	15.0
California	--	--	--	--	31.2	11.7	30.1	6.6	20.4

Source: Estimates from interview data

Table B-7

Calculation of Total Movements of Fresh and Frozen Salmon

Origination:

Alaska:	Catch 25.5 x .85 = 21.7 mm lb	
	- Canned Volume equiv.	11.3
	- Mild Cured Volume[3] (1579 tierces)	1.3
	Net Fresh & Frozen	9.1
	- Export Volume[3]	2.0
	Net Domestic Fresh & Frozen	7.1
	- Los Angeles[4]	.3
		6.8

Seattle:	Catch (Total Wash.) 18.7 x .85 = 15.9 mm lb.	
	- Canned Volume Equiv.[1]	1.9
	Net Fresh & Frozen	14.0
	+ Canadian Import	4.9
	+ Oregon origination	1.6
	+ Alaska origination	6.8
	Total Fresh & Frozen	27.3
	- Exports	12.6
	Net Domestic Fresh & Frozen	14.7

Distribution: % in ( )

Seattle Area (26.3) = 3.87	
- Mild Cure (1853 tierces) = 1.53	2.34
Other Wash (1.1)	.16
Portland (0.6)	.09
San Francisco (6.5)	.96
Los Angeles (8.9)	1.31
Other Calif. (0.3)	.04
Midwest (23.1)	3.40
East Coast (32.8)	4.82

Oregon:	Total Catch 12.4 x .85 = 10.5 mm lb.	
	- Canned Volume Equiv.[2]	1.9 mm lbs.
	Net Fresh and Frozen	8.6
	- Exports[3]	0.3
		8.3

Table B-7 Continued

Distribution:

Seattle Area	(18.9)		1.57
Portland	(5.5)		.46
Other Oregon	(2.5)		.29
San Francisco	(6.0)		.50
Los Angeles	(18.0)		1.50
Calif. Other	(28.6)		2.38
Midwest	(5.4)		0.45
East Coast	(15.0)		1.25

California: Total Catch 9.4 x .85 = 8.0
- Export 0.5
Net Domestic Fresh & Frozen 7.5

Distribution:

San Francisco	(31.2)		2.34
Los Angeles	(11.7)		.88
Other Calif.	(30.1)	2.26	
less mild curing	(942 tierces)	.78	1.48
Midwest	(6.6)		.49
East Coast	(20.4)		1.53

Destination:

Seattle

Local	2.57
fr Portland	1.57
	4.14

Portland

fr Seattle	.09
Local	.46
other Ore.	.29
	.84

San Francisco

Local Calif.	2.34
fr Seattle	1.01
fr Portland	.50
	3.85

Table B-7 Continued

Los Angeles:	
Local Calif.	.88
fr Seattle	1.40
fr Portland	1.50
fr Alaska	.30
	4.18
Midwest:	
fr Seattle	3.63
fr Portland	0.45
fr Calif.	.49
	4.57
East Coast	
fr Seattle	4.89
fr Portland	1.25
fr Calif.	1.43
	7.57

Exports:

	U. K.	France
Seattle	4.0	3.5
Portland	0.1	0.1
San Francisco	0.1	0.3

Mild Cure Production:	
Alaska	1.30
Washington	1.53
California	.78
	3.61

1
Canned volume equivalent calculated to compensate for waste $(\frac{.85}{.65})$ (canned volume) = estimated dressed fish equivalent. Data from canned fishery production 1960, U.S. Bureau of Commercial Fisheries.

2
Mild-cured data number of tierces x 825 lbs. Data from National Fisherman Annual Yearbook.

3
Data from tabulations by Custom District, U.S. Customs service.

4
From survey.

Appendix Table C-1

Data Used for Product Form Decision Regression and Causal Path Program

Variables																
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
40.9	22.9	51.1	116.4	402.4	86.6	179.1	30.5	42.5	1547	3948	4410	4146	8189	8681	16360	266.4
37.1	23.3	50.9	118.8	303.8	89.8	166.8	36.5	53.8	616	1445	1849	3098	6830	7360	10540	307.6
31.1	20.2	47.7	86.2	311.0	80.8	142.4	35.3	49.0	2319	4703	5348	2930	6014	6606	16996	201.7
37.0	13.7	37.7	87.5	312.7	72.5	142.6	47.5	67.5	768	2026	2166	2103	5791	6560	13434	235.4
38.3	23.2	50.1	98.2	435.4	83.9	146.6	37.5	55.0	1405	3165	3595	2001	4725	5168	9218	310.3
31.1	27.7	52.8	113.2	482.1	88.5	167.0	39.5	58.5	1084	1992	2330	3012	4716	5453	11988	314.6
34.9	28.1	55.3	144.1	417.9	91.0	195.2	37.3	55.5	1729	3635	4430	4250	6912	7564	13819	294.3
37.8	38.1	66.9	133.1	480.8	111.9	202.0	44.0	60.0	1447	3776	4503	2601	6097	5659	21404	352.1
41.9	38.5	67.8	99.1	421.9	117.2	155.2	43.0	56.5	2149	5048	5596	3269	5810	7494	17524	326.7
35.7	38.7	66.0	122.5	556.1	120.0	191.9	40.5	64.3	624	3101	3237	4933	8661	9327	11683	387.5
36.1	38.3	64.0	99.0	355.4	102.4	149.0	49.5	73.5	423	2890	3519	6098	9662	12441	22235	216.7

Variable 1 Percent fresh to fresh and frozen.
2 Coho landings (in millions of pounds).
3 Coho and Chinook (in millions of pounds).
4 Coho, Chinook and Chum landings (in millions of pounds).
5 Canada and U.S. total landings in millions of pounds.
6 U.S. and Canada Coho and Chinook landings in millions of pounds.
7 U.S. and Canada Coho, Chinook and Chum landings in millions of pounds.
8 Price large Coho, Seattle (in cents).
9 Price large Coho, Chicago (in cents).
10 Coho frozen inventories April 30 each year in millions of pounds.
11 Coho and Chinook inventories April 30 each year in millions of pounds.
12 Coho, Chinook and Chum frozen inventories April 30 each year in millions of pounds.
13 Coho consumption from frozen stocks preceding season (October 31-April 30).
14 Coho and Chinook consumption from frozen stocks preceding season (October 31-April 30).
15 Coho, Chinook and Chum consumption from frozen stocks preceding season (October 31-April 30).
16 Total production volume in U.S. landings plus imports in millions of pounds.
17 Total landings in millions of pounds.

Appendix Table C-2

Intercorrelation Matrix

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	1.00	0.18	0.24	0.03	0.03	0.28	0.07	0.02	-0.12	0.05	0.24	0.21	-0.02	0.14	0.13	0.13	0.23
2		1.00	0.90	0.35	0.56	0.86	0.42	0.34	0.34	-0.07	0.28	0.30	0.51	0.37	0.39	0.44	0.49
3			1.00	0.38	0.55	0.87	0.45	0.25	0.23	0.02	0.36	0.38	0.47	0.35	0.35	0.44	0.51
4				1.00	0.47	0.34	0.86	-0.22	-0.12	0.07	-0.06	0.00	0.23	0.18	0.00	-0.03	0.55
5					1.00	0.58	0.58	-0.01	0.09	-0.03	0.13	0.09	0.15	0.01	-0.08	-0.09	0.74
6						1.00	0.46	0.27	0.26	-0.04	0.31	0.30	0.41	0.34	0.32	0.33	0.60
7							1.00	-0.19	-0.12	-0.03	0.06	0.09	0.22	0.23	0.00	0.07	0.61
8								1.00	0.85	-0.40	-0.18	-0.18	0.14	0.12	0.26	0.39	-0.06
9									1.00	-0.59	-0.35	-0.35	0.29	0.25	0.36	0.21	0.01
10										1.00	0.76	0.76	-0.31	-0.40	-0.38	0.16	-0.10
11											1.00	0.90	0.07	0.02	0.03	0.44	-0.04
12												1.00	0.09	0.03	0.03	0.49	-0.07
13													1.00	0.82	0.85	0.55	-0.06
14														1.00	0.85	0.37	-0.11
15															1.00	0.40	-0.22
16																1.00	-0.28
17																	1.00

Variable
1. Percent from to fresh and frozen.
2. Coho landings (in millions of pounds).
3. Coho and Chinook (in millions of pounds).
4. Coho, Chinook and Chum landings (in millions of pounds).
5. Canada and U.S. total landings in millions of pounds.
6. U.S. and Canada Coho and Chinook landings in millions of pounds.
7. U.S. and Canada Coho, Chinook and Chum landings in millions of pounds.
8. Price large Coho, Seattle (in cents).
9. Price large Coho, Seattle (in cents).
10. Coho frozen inventories April 30 each year in millions of pounds.
11. Coho and Chinook inventories April 30 each year in millions of pounds.
12. Coho, Chinook and Chum frozen inventories April 30 each year in millions of pounds.
13. Coho consumption from frozen stocks preceding season (October 31-April 30).
14. Coho and Chinook consumption from frozen stocks preceding season (October 31-April 30).
15. Coho, Chinook and Chum consumption from frozen stocks preceding season (October 31-April 30).
16. Total production volume in U.S. landings plus imports in millions of pounds.
17. Total landings in millions of pounds.