THE EASTERN PACIFIC HALIBUT FISHERY 1888-1972: AN EVOLUTIONARY STUDY OF THE SPATIAL STRUCTURE OF A RESOURCE-BASED COMPLEX

by

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B.A.(Ed), B.A.(Honours), Memorial University of Newfoundland 1970,1971

A THESIS SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS

in the Department of Geography

We accept this thesis as conforming to the required standard

THE UNIVERSITY OF BRITISH COLUMBIA
April, 1973
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Abstract

This study examines the spatial evolution of the Eastern Pacific halibut fishery over the period 1888-1972 in terms of resource exploitation and vessel-port interaction and attempts to delineate the factors which brought about the observed patterns.

Four distinct stages of development are identified: (1) a stage of spatial confinement and resource depletion characterized by corporate involvement and restricted vessel range, (2) a stage of spatial extension, company fleet decline, and independent fleet expansion, (3) a stage of spatial adjustment, quota control, and extreme competition, (4) a stage of further spatial extension, fleet decline, and maximum sustained yields.

The spatial structure of the industry at each stage of development is shown to be a function of resource availability, fishing costs, and changes in halibut fleet behavior. The time-cost-distance factor between producing grounds and the landing/processing sector of the industry proved to be a critical factor in a fishery that was characterized by increased competition for annual quotas.

Conceptual models of the industry's spatial structure have been developed to portray the major changes which occurred from one stage to the next. These in turn are further developed to conceptualize the evolution of the halibut fishery over the 1888-1972 period.
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Acknowledgements

I wish to express my sincere thanks to all those who assisted me in the preparation of this thesis. A very rewarding insight into all aspects of the halibut fishery was achieved during the summer of 1972 when the writer was stationed at Prince Rupert. All of the fishermen who took of their time to engage in lively discussion with the writer are too numerous to mention but special thanks are expressed to Messrs. John Johnson, David Grant, Jack Prince, William Mossman, John Johnson (Sr.), George Penny, Allan Wainwright, and Harold Grinstad. Mr. Don McCleod, Manager, Booth Fisheries, Prince Rupert; and N. R. Christensen, the Canadian Fishing Co. Ltd., Vancouver were very helpful in supplying requested information on company involvement in the industry.

Mr. H. E. Lokken, Manager, Fishing Vessel Owner's Association, Seattle, and Mr. C. R. Nordahl, Secretary Treasurer of the Deep Sea Fishermen's Union of the Pacific, Seattle, supplied information on the number of vessels and men in their particular organizations and additional information on halibut landing practices and prices. Mr. G. Morris Southward of the IPHC was most helpful in supplying requested information. Special thanks to Dr. J. D. Chapman and Dr. A. F. Farley of the Geography Department, University of British Columbia for assistance rendered throughout the preparation of this thesis.
Chapter I
Introduction

The evolution of the Eastern Pacific halibut fishery presents an interesting subject area for geographic inquiry. Associated with the development and expansion of the fishery were distinct phases through which activities related to exploitation of the halibut resource passed. Major shifts to new producing grounds, changes in the characteristics of the halibut fleet, expansion of the cold storage sector, and the fluctuating roles of halibut ports represented reaction to availability of halibut stocks on different grounds at each stage of development. The major changes and shifts which characterized the evolution of the fishery provide the major themes of this study. No attempt has been made to elaborate upon cultural and ethnic aspects of the fishery. The dominance of Scandinavians, especially Norweigans, in the Pacific halibut fishery warrants a study in itself.

Since 1888, when commercial exploitation of the resource commenced, the Pacific halibut fishery has passed through four main stages of development. The 1888-1912 period identified in this study as "Spatial Confinement and Resource Depletion" was characterized by extensive fishing on grounds between Cape Flattery, Washington and Cape Spencer, Alaska -- a lineal extent of approximately 600 miles. Because the independent fleet (fishermen-owned) was relatively small, most of the catch was taken by the large company-owned steamers. Major ports associated with the
growth of the industry were located on Puget Sound, Washington and on the Strait of Georgia in southern British Columbia at railhead locations. Towards the end of the period, with market improvements and northward expansion of the catching sector, there was increased movement of the processing sector into northern British Columbia and Southeast Alaska.

The second phase of the fishery herein titled "Shift to Western Grounds and Fleet Expansion 1913-1931" saw intensive fishing on grounds from Cape Flattery to the Shumagin Islands in western Alaska. Rapid expansion of the independent fleet occurred and by the end of the period the company-owned fleets were no longer engaged in the fishery. Innovations in vessel and engine design and less emphasis on dory fishing, accompanied the move to a truly deep-sea fishery. The completion of the Grand Trunk Pacific Railway to Prince Rupert in 1914 caused the established ports within the industry (Seattle and Vancouver) to lose ground to Prince Rupert. In addition to halibut landings by its own fleet, a large number of vessels from other ports elected to land their catches at Prince Rupert. Towards the end of the period steps were taken to regulate the fishery because of stock depletion. The signing of the Halibut Convention in 1923 by the United States and Canada was to have an important bearing on subsequent development of the industry.

The third phase of the fishery, "Spatial Adjustment, Commission Quota Control, and Extreme Competition 1932-1951" saw confinement of the fishery to previously developed boundaries. No shifts to new grounds
occurred but a greater percentage of the catch was now being taken on grounds between Cape Spencer and the Shumagin Islands. Regulation of the fishery on a quota basis, commencing in 1932, had implications for the industry as a whole. Increases in halibut stocks resulted in a large increase in the number of vessels engaged in the fishery. Increased competition for the annual quotas decreased the length of the fishing season from nine months in 1932 to approximately one month in 1951 on grounds south of Cape Spencer. This placed time constraints on movement of the catching sector and affected the roles of ports in the industry.

Stage four of the fishery, "Spatial Encompassment, Fleet Decline, and Sustained Yields 1952-1972" was characterized by both the largest and smallest catches in the regulated phase of the industry. The halibut grounds in the Bering Sea were exploited intensively for the first time, and as a result all halibut grounds of the Eastern Pacific had come under exploitation. Concentration of effort on grounds west of the Gulf of Alaska led to increased halibut landings at ports in western Alaska. Competition for the resource over most sections of the halibut grounds diminished sharply as the result of a large decrease in the number of vessels engaged in the fishery. Towards the end of the period, however, greatly reduced quotas and catches were causing much concern within the industry at all levels.

Figure 1 shows the trends in total catch and the number of vessels engaged in the fishery at all four periods of development. Figure 2 is designed to depict the most significant happenings which occurred in the evolution of the fishery and gives an overall view of transformation within the Pacific halibut fishery.
Figure 1. Trends in Total Catch and Number of Vessels 1888–1972
FIGURE 2. TRANSFORMATION WITHIN THE HALIBUT FISHERY 1888—1972.
The major theme of this study is that the spatial structure of the industry at each stage of development was determined by resource availability, fishing costs, and variation in landing practices by the halibut fleet. Another theme is that the time-distance-cost factor between the producing grounds and the landing/processing sector proved to be a very critical element in determining the role of individual ports during expansion of the halibut fishery. In addition, the common property nature of the fishery was to have important implications on rents which were generated within the fishery.

Methodology

The methodology of this study has its origins in the methodological and substantive work of Lukerman. Lukerman has maintained that a more geographic economic geography would start from observations with the recording of data on maps. Essentially, this constitutes a traditional empirical-inductive approach and is based on four main steps: (1) the selection of a time period, (2) the division of the selected time period into various stages on the basis of output, employment, etc., (3) the cartographic representation of the spatial structure of the industry being examined for each of the designated stages, and (4) the description and analysis of the spatial structure of the various stages and how they compare through time.

To apply this methodology requires the development of general conceptual frameworks for the resource-activity complex under examination (i.e. a fishing complex), and for the spatial-structural characteristics of the particular complex (i.e. the Pacific halibut fishery). Such frameworks lead to the development of a conceptual model to portray change in the complex through time.
Activities associated with extractive types of industry such as fishing coincide spatially with the sources of raw material and are largely determined by the changing nature of the resource. Physical and economic aspects of a resource such as natural abundance and costs of exploitation have direct bearing on the spatial pattern of a resource-based industry. One of the central themes of this study is that relating to spatial and structural change. The sequence of change in size, number, and location of activities and interacting circulatory linkages in the halibut fishery would help explain the changing patterns of economic activity related to primary resource availability, accessibility, and exploitation.

From a spatial viewpoint, the significant factors of the Pacific halibut fishery are the limited extent of fishing grounds; the uneven distribution of the halibut resource; the marketing of the resource in a fresh or fresh-frozen form; and dependence on external markets considerable distances from areas of production. At each stage of development the spatial structure of the catching and processing sectors of the industry reflected these factors. This study identifies the critical factors associated with the evolution of the fishery, and examines how they contributed to spatial change within the industry.

The four main stages in the study have been selected on the basis of sequential exploitation of the Pacific halibut grounds. Stage one centres around exploitation of the grounds south of Cape Spencer. The second stage examines the fishery after grounds west of Cape Spencer were exploited between 1913 and 1931. Stage three of the fishery corresponds to the period when the industry adjusted to previously established boundaries. The final period saw extension of the fishery
to Bering Sea grounds.

Delineation of periods on the basis of output, number of vessels and fishermen employed, and price would not be practical because they would overlap the sequential pattern of fishing ground exploitation. There is, however, a strong relationship between the extent of grounds fished and total catch. Since all sectors of the industry were sensitive to raw material supply at each stage of development, the shift to new grounds necessitated adjustments to their internal structure to accommodate changes in halibut supply. As a result the evolution of the fishery was characterized by a series of spatial and organizational patterns.

Geography has traditionally concerned itself with man-land relationships. This, according to Padgett, explains why sea industries have been a neglected field of geographic inquiry. The geography of a fishing complex is somewhat different from that of any other extractive industry. The main difference is that the resource associated with a fishery complex may vary considerably over space within short periods of time. Fishing industries are characterized by large numbers of individual entrepreneurs, none of whom has control or tenure over the resource. Behavior exhibited by those engaged in a fishing industry tends to differ, therefore, from that of extractive industries such as mining and forestry for this reason.

Padgett recognizes an holistic approach to be one of the main strengths of a geographic study of sea industries and argues for studies which thoroughly explore and interrelate the physical, economic, ethnic and cultural factors. The ethnic and cultural factors are beyond the scope of this study because it is designed to show spatial change within the halibut fishery. Two recent studies are perhaps best representative
of the types of marine studies Padgett argues for. "The Fisheries of Europe" Coull (1972)\(^5\) and "Regional Concentration of the Japanese Skipjack-Tuna Fishery" Keen (1971)\(^6\) both trace the patterns of activity associated with fishing complexes under examination.

Some of the traditional empirical-inductive studies which have examined various single species fishing complexes include: "The Cod Fisheries", Innis (1940); "Salmon Industry of the Pacific Coast" Gregory (1940); "The Flounder Industry of the Soviet Far East," Katkoff (1952); "The Alaskan Salmon Industry-Prologue and Prospect", Mathieson (1954); "The Grouper Fishery of Cay Glory, British Honduras", Craig (1969); and "The West Canadian Salmon Industry", Jungst (1972)\(^12\). In terms of relating the physical environment to such cultural factors as market, gear, and vessel design one of the better studies is "World Sea Fisheries," Morgan (1956)\(^13\). Because of its scope, however, it is quite general and does not examine any one regional fishery in the light of all factors which have come to bear upon it. One of the few theoretical studies is "A Model of a Fishing Region", Serck-Hanssen (1964)\(^14\). It attempts to select the best location for processing firms associated with a fishing complex.

The geographical literature contains relatively few studies of marine fisheries. Those that do exist are characterized by the absence of a well-defined conceptual framework, an emphasis upon description, the treatment of elements of the total fishing complex individually rather than as parts of an interrelated complex, and a superficial treatment of the utilization of the resource through time.

The Study Region

The study deals with the exploitation of the halibut resource on
grounds between Cape Flattery, Washington and the Eastern Bering Sea, including the Aleutian Chain. Within this region, a common fishery based on the exploitation of the Pacific halibut, has been developed by United States and Canadian fishing fleets. The entire coastal area comprising more than 3,000 miles of coastline is marked by a relatively narrow continental shelf over which the fishery has extended. For administrative and regulatory purposes, the area has been divided into two major divisions: Area 2 consists of grounds south of Cape Spencer, Alaska, and Area 3 comprises the grounds west of Cape Spencer. Although limited halibut stocks have supported a small halibut fishery from Cape Flattery to northern California (formerly Area 1 but now a part of Area 2), the fishery is not characterized by such intensity of exploitation as the fishery north of Cape Flattery. For this reason it is not examined in detail.

The Pacific halibut fishery has been jointly conducted by the United States and Canada since 1888. Because of the common characteristics of the fishery each national fishery is not examined individually. Where necessary, and if has bearing on spatial implications, distinction is made between American and Canadian interests in the fishery.

Effective settlement within the region as a whole (Washington, British Columbia, and Alaska) dates from the eighteen fifties. The fishing industry began early in the European settlement history and has played a significant role in the economic life of the Pacific Northwest ever since. The halibut industry, however, has been overshadowed by the very important salmon industry of the region. Nevertheless, halibut has always ranked amongst the top three or four commercial species in terms of volume and value.
Data Sources

Because the study covers a rather lengthy time period a large number of data sources have been employed. For the period prior to 1910, and even for some subsequent years, an accurate picture of halibut landings by region, the number and size of vessels engaged in the fishery, and other relevant data for each are difficult to obtain. Nevertheless, such data as were available for the period leading up to the development of the fishery were obtained from the Annual Bulletin(s) of the U. S. Bureau of Fisheries 1872-1910. Between 1874-1929/30 the Annual Report(s) of the Canada Department of Marine and Fisheries, Fisheries Branch, provide information on catches, landings, etc. For the years 1902-1935 the Annual Report(s) of the British Columbia Department of Fisheries gives accounts of the expanding halibut fishery. Statistics-wise, the Annual Yearbook(s) of the Pacific Fisherman proved to be an invaluable source of information. From 1928 onwards the Reports of the International Fisheries Commission (later the International Pacific Halibut Commission) deal with all aspects related to the biology, exploitation, and management of the halibut resource. The monthly publications of Western Fisheries from 1929 onwards provide an added source on matters relating to expansion of the fishery. A detailed account of the development of Prince Rupert into the world's leading halibut port was obtained from the Prince Rupert Daily News for the years 1911-1920. In addition, a large number of trade journals and government publications were utilized (see bibliography).

Most of the data used in the compilation of maps on halibut catches and landings was taken from Report No. 17 of the International Fisheries Commission entitled "Pacific Coast Halibut Landings 1888-1950 and Catch According to Area of Origin". As well, "Fishery Leaflet 602" of the U.S.
Bureau of Fisheries, "Eastern Pacific Halibut Fishery 1888-1966" provided basic information on landings of halibut by nationality of vessel, catch of halibut by fishing ground, and landings by port, and prices received were obtained from issues of Pacific Fisherman, and in recent years from the IPHC reports and Western Fisheries.

The following chapter is designed to provide technical information on the Pacific halibut and characteristics of the fishery. Chapters 3-6 deal with each period in the evolution of the fishery, each containing schematic models of the spatial and functional structure of the industry. Chapter 7 attempts to develop a conceptual model showing the evolution of the Pacific halibut fishery.
References


4. Ibid. p. 28.


Chapter II  
The Halibut Resource and Fishery Characteristics

The Pacific halibut (Hippoglossus hippoglossus stenolepis) is the largest member of the flatfish family and may exceed 250 pounds in weight, although the average size of the Eastern Pacific catch is between 30 and 35 pounds. Halibut is a boreal species and is found at depths where the temperature ranges from 3° to 8° Centigrade. Unlike free-swimming, or pelagic species such as Salmon, the halibut is a demersal or groundfish species and is confined to the continental shelf at depths generally less than 250 fathoms (1500 feet).

Stocks are most abundant on grounds extending from the northern tip of Vancouver Island to the Shumagin Islands in western Alaska. The joint fishery by American and Canadian fishing fleets extends from the vicinity of Cape Flattery, Washington to the eastern margins of the Bering Sea and provides the focus for this study. On grounds south of Cape Flattery, relatively sparse halibut stocks support a small fishery for American vessels only. The Eastern Pacific fishery accounts for approximately sixty percent of total world halibut production. The remaining forty percent is taken from grounds of the Western Pacific by Japanese and Russian fleets and by the various fleets fishing the North Atlantic. In recent years the total world catch has amounted to approximately 100 million pounds.

Figure 3 shows the continental shelf off the eastern North Pacific coastline and the distribution of the Pacific halibut grounds. The dominant feature of the shelf area is the relatively constricted extent of ocean depths less than 250 fathoms. The rapid increase in ocean depth beyond the 100 fathom isobath, the recognized limit of
Figure 3. EXTENT OF THE CONTINENTAL SHELF OF THE EASTERN NORTH PACIFIC.
the continental shelf, has important bearing on halibut stocks since it prevents considerable offshore movement of the species. During the winter months there occurs an offshore movement of halibut to depths from 125 to 250 fathoms. For the greater part of the year, however, halibut stocks of the eastern North Pacific are found at considerably less depth.

The average width of the eastern North Pacific Shelf is approximately 50 miles and its approximate area is 80 thousand square miles. The most prolific halibut grounds of the region are confined to generally sandy-gravel bottom and represent only a small proportion of the total shelf area. Some of the more important halibut banks (Figure 3) include the Goose Island Banks in southern Hecate Strait (600 sq. miles); the area known as the Flats in northern Hecate Strait (1200 sq. miles); Portlock Bank in the Gulf of Alaska (6800 sq. miles); and Albatross Bank off Kodiak Island (3700 sq. miles). Although the Bering Sea shelf is quite extensive, halibut stocks are confined mainly to the southeastern edge of it because ecological conditions are more favourable than over the remainder of the region's shallow shelf. Extensive upwelling occurs throughout the entire region and indirectly supports the prolific fish stocks which exist.

Extensive experiments conducted by the International Fisheries Commission (IFC), and its successor, the International Pacific Halibut Commission (IPHC), showed the Eastern Pacific halibut population to consist of two distinct stocks, the Bering Sea and Gulf of Alaska stock and those on the grounds south of Cape Spencer. It was on this basis that the IFC divided the region into two primary areas: Area 2 comprises the grounds south of Cape Spencer and Area 3 those west of Cape Spencer.
The restricted area over which halibut occur in the eastern North Pacific had important bearing on the evolution of the fishery. Fishery expansion and vessel movement could only occur in a generally northwesterly direction away from the dominant ports in Washington and British Columbia. Cold storage and processing plants were located at strategic locations along the region's coastline in response to resource depletion at various stages of development and rail connection to market. By the mid nineteen fifties major halibut ports had developed along approximately 3,000 miles of coastline from Seattle, Washington to Sand Point, Alaska.

Catching of Halibut

At each stage of development the catching sector of the industry consisted of vessels of various types and sizes. In the initial phase of the fishery, sailing schooners and sloops were employed. Towards the end of the 1888-1912 period practically all of these had auxiliary power installed. Fishing was conducted from dories carried by the vessels. Fishing was also carried out from small open boats of less than five to ten tons based at many fishing stations throughout the region. The company-owned vessels which were introduced into the fishery were relatively large. They averaged approximately 125 tons, were about 120 feet long, carried up to 14 dories, and had a crew of 20 to 44 men.

From 1912 to 1923 schooners averaging 25-60 tons were introduced into the independent fleet. They were powered by gasoline engines and carried up to 8 dories. There was an increased trend towards longlining from vessels but it was not until after 1923, with the advent of the diesel engine, that this type of fishery expanded. After 1923, new vessels entering the fleet were almost entirely longliners, and they
did not have the prominent sailing lines of earlier vessels. In recent years larger vessels of the seiner class have been introduced into the fishery but few of them exceed 100 feet in length and average 50-100 tons.

Most of the Eastern Pacific halibut catch is taken with longline gear (Figure 4) although small quantities are caught by trolling and hand-lining. Longline gear consists of a long groundline to which is attached gangings and hooks at equal intervals, e.g. 9, 13, and 18 feet. When baited and set, it rests on the ocean bottom in the manner illustrated.

Figure 5 shows how gear is set to accommodate the areal extent and configuration of fishing grounds. The method of deployment varies through the year in response to halibut movement, size of the grounds being fished, bottom topography, and depth of water being fished. The hook spacing is determined by the size of the grounds being fished, resource availability, and the size of the vessels. In the early years of the fishery, when dories were employed, the intervals between gangings were generally 9 feet. When longlining from vessels took place, the intervals were increased to 13 feet but subsequent modifications have resulted in 18, 21, 24, and 26-foot gear being introduced in the fishery. For management purposes, the IFC in 1943 adopted 13-foot gear with 120 hooks as the "standard skate" for all areas to determine the basic unit of effort. On the basis of recent experiments the IPHC has found that the "standard skate" underestimated effort and over-estimated catch per unit of effort (CPUE).

Fishing by otter trawl and other types of bottom net has been prohibited by the IPHC. Although this has caused some concern amongst the dragger fleet operating out of Eastern Pacific ports, the Commission
Figure 4. LONGLINE GEAR EMPLOYED IN THE EASTERN PACIFIC HALIBUT FISHERY.
Figure 5. MANNER IN WHICH GEAR IS DEPLOYED TO ACCOMMODATE BOTTOM TOPOGRAPHY, ETC.
based its decision on fishing practices elsewhere. In Norway it was determined that large halibut were particularly vulnerable to bottom-set gill nets and in 1938 the Commission prohibited their use in the Pacific halibut fishery\(^5\) even before they were employed. In 1944 the Commission prohibited the use of otter trawls because it was shown that in the North Atlantic small halibut were susceptible to this type of gear. Since 1944 dory fishing has not been permitted because this type of fishing was removing large quantities of small halibut.

While the longline is a highly selective and a relatively inexpensive type of gear it does have its disadvantages. It is a labour-intensive operation as considerable effort has to be expended in hauling, baiting, and repairing the gear. As a result the actual fishing day tends to be quite long and often amounts to twenty hours. In dragging (otter trawling) operations on the other hand, very little effort is involved in the actual fishing operation. A 75-foot longliner fishing for halibut may employ 7-9 men, but a dragger of the same size may only employ 4-5 men.

The phasing-out of the company-owned steamer fleet and the prohibition of the setline fishery with dory vessels saw the passing, in Eastern Pacific waters, of a very interesting spatial fishing pattern. When vessels carried dories from which longlining operations could be carried out, fishermen employed a number of fishing patterns which are depicted in Figure 6. Fishing from dories was a two-man operation, and depending on the size of the vessels, a number of dories were employed. Depending on such factors as weather conditions, abundance of halibut, and extent of fishing grounds, the dories fished in the manner shown in Figure 6. Their small size and restricted range necessitated this mothership type of fishing operation. One of the last surviving operations of this type
Figure 6. BASIC FISHING PATTERNS.

1. On considerable expanses of level ground.

2. When fishing the "edge" of the ground in deeper waters.

3. When fishing edge of ground and fish relatively confined.

Legend

- Mother Ship
- Dories
- Direction and distance (usually less than 5 miles)
- Edge of continental shelf
is the Portuguese "White Fleet" cod fishery in North Atlantic waters.

Management and Exploitation

Since 1924 the halibut fishery of the Eastern Pacific has been managed by the International Pacific Halibut Commission (formerly the International Fisheries Commission), consisting of representatives of Canada and the United States. The IPHC manages the fishery solely on a biological basis and has no control over economic aspects of the fishery, e.g. limiting the number of vessels engaged in the fishery.

The signing of the Halibut Convention in 1923 came after extensive depletion of halibut stocks had occurred during the unregulated phase of the fishery (1888-1923). It was one of the first international agreements aimed at protecting a depleted marine resource, the International Pacific Fur Seal Treaty having been signed in 1911. Under the Convention of 1923, a closed season to coincide with the halibut spawning period (November 16 to February 15) was instituted, with the costs of regulating the fishery being shared equally by the two countries. The Commission was also directed to engage in very extensive biological investigations pertaining to the life history of the halibut.

The Halibut Convention of 1930 provided for: (1) the division of the convention waters into areas, (2) the limiting of the catch of halibut to be taken from each area, (3) determining the size and character of halibut fishing appliances (gear) employed, and (4) the closure of all fishing areas frequented by small immature halibut. This Convention led to the institution of annual quotas commencing in 1932. Subsequent Halibut Conventions of 1937, 1950, and of 1953 provided for further regulation of the fishing in Convention waters. These Conventions defined "convention
waters" to comprise the territorial waters and high seas off the western coasts of Canada and the United States, including the southern as well as the western coast of Alaska. The Convention of 1953 gave the IPHC the power to take necessary steps to obtain maximum sustained yields from the Pacific halibut stocks.

It was mainly on the basis that the United States and Canada had undertaken to manage and preserve halibut stocks that foreign fleets were discouraged from entering the Pacific halibut fishery. In 1937, British fishing interests were preparing to send an expedition to the North Pacific to take halibut, but extreme opposition from the IFC, and Pacific halibut fishermen and dealers led to abandonment of the project. Movement of Japanese vessels in particular into the Bering Sea in the early nineteen-sixties caused grave concern to those engaged in the industry. In 1962, the International North Pacific Fisheries Commission agreed with Japan that sections of the Bering Sea were outside Japanese fishing abstention as specified in the International Convention for the High Sea Fisheries of the North Pacific Ocean. As a result the Japanese were permitted to engage in the Bering Sea setline fishery against the wishes of the IPHC. This was to have important implications for the fishery as a whole, since there is considerable intermingling of halibut stocks of the Bering Sea and Gulf of Alaska waters.

Prior to 1961, the Eastern Pacific halibut fishery was conducted exclusively by Canadian and American fishing fleets. The commencement of halibut operations in the Bering Sea by a foreign nation no longer gave the North American halibut fleet monopoly over all sectors of the halibut grounds. On grounds outside the Bering Sea, stocks are harvested exclusively by American and Canadian fleets except that incidental
catches are made by Russian and Japanese fishing operations for groundfish species other than halibut. Such incidental catches are not permitted to be retained and must be returned to the ocean. Before expansion of the Japanese and Russian fishing operations on a global scale mainly after World War II, the isolated and relatively restricted extent of the Eastern Pacific fishing grounds hindered foreign fishing penetration into the region. This greatly facilitated management of the resource, and as a result the once-depleted stocks were restored to near-maximum sustainable yield levels.

There has been no administrative division of catch between the American and Canadian fleets since commercial exploitation of the fishery began. After the establishment of annual quotas in 1932, fishermen of both nations continued to compete for a share of the catch, and up to 1962, the American Sector of the halibut fleet accounted for the largest percentage of annual catches. Since 1963, however, the Canadian fleet has accounted for the largest percentage of catch. Such a reversal is attributed to the decline of the American halibut fleet relative to that of Canada. Reciprocal port privileges were established between the two countries in the early phase of the fishery. American vessels are not permitted, however, to fish inside the three-mile territorial limit of Canada, and vice versa.

Since the rise of the independent fleets, halibut fishermen and vessel owners have maintained strong unions and fishing vessel-owner associations. These groups have continued to maintain a strong bargaining position in the halibut fishery. Since the IPHC does not directly control the economic aspects of the fishery, regulation on a non-biological basis remained with the fishermen and vessel owners. As early as 1911 there was concern on their part over excessive depletion of the halibut resource, and this eventually led to the signing of the Halibut Convention in 1923.
The institution of the various between-trip layover programs after 1932 was made by the fleet to assure more orderly exploitation and marketing of the halibut catch. The entrance of non-regular halibut fishermen into the fishery, however, made it very difficult to manage the fishery on an economic basis. In recent years, especially since 1956, there has been little free movement of vessels into the fishery, and the size of the fleet has shown a sharp downward trend. Unlike most fisheries based on the harvesting of a common-property resource, the Pacific halibut fishery, from a biological viewpoint, has been very effectively managed. This has required and received the full co-operation of the Canadian and American governments, fishermen, vessel owners, and companies engaged in the exploitation of halibut.

Processing and Marketing

There is little secondary processing of the halibut catch. Almost all of the catch is marketed in a fresh or fresh-frozen form. The excellent keeping qualities of the species when held in cold storage makes it possible to spread marketing throughout the year and thus maintain prices. In the early stages of the fishery, when fishing operations were carried out on a year-round basis, the role of the cold storage sector was significantly less than in more recent stages of the fishery. A greater percentage of the catch is now frozen, and held for longer periods of time, because the length of the fishing season has been reduced. In addition, improvements in fresh-food distribution, wholesale and retail marketing and restaurant practices have contributed to an increase in the amount of halibut that is frozen. All large firms in the halibut industry maintain frozen inventories of halibut to provide wholesale customer demands over the year.
Unlike most commercial species of fish landed at Pacific Northwest ports, the Pacific halibut catch is sold by auction. Halibut exchanges are located at all of the major ports, and buyers bid for each vessel delivery. All prices paid at the smaller ports throughout the region are scaled according to prices paid at neighbouring auction ports. In the days of the company fleets the vessels sold directly to the companies they fished for and thus bypassed the halibut exchange. The rise of independent fleets at the major ports was accompanied by the establishment of exchanges which were operated by the halibut vessel owners and fishermen. Most halibut vessels are owned by self-employed fishermen. There is no captive ownership of vessels by companies engaged in the buying of halibut, and as a result the independent vessels have been free to land their catches at ports of their choice.

Almost all of the American fleet output of halibut finds a market in the larger urban areas of the United States, mainly east of the Mississippi. Approximately seventy percent of the Canadian catch is marketed in the United States as well, and from time to time Canada has exported small amounts of halibut to European countries, principally Britain. Demand for Pacific halibut in the North American market has remained strong, despite isolated fluctuations. Because of the limited world supply of this species it commands premium prices. The North American whitefish market, however, has always been highly competitive, and halibut must compete with other whitefish species such as cod, flounder, perch and sole. From initial exploitation, the survival of the industry has been dependent on markets three or four thousand miles away. Strong transportation links with the eastern markets were the key pre-requisites for early development of the fishery and continue to play a leading role in the marketing of the
perishable catch.

**Historical Development**

Before large scale commercial development of the Eastern Pacific halibut fishery occurred, the presence of an abundant halibut resource was well known. The coastal Indians of the region had long relied upon the species to supply part of their food requirements. The Makah Indians of Cape Flattery, the Haidas of the Queen Charlotte Islands, and the Sitka Indians of Southeast Alaska, and other coastal groups caught halibut. Both Cook and Belcher took small quantities of halibut in Alaskan waters. The cod expeditions from San Francisco and Puget Sound from the eighteen sixties onwards made large incidental catches of halibut in Alaskan waters.

Prior to 1888 the fishery industry of the region was dominated by the salmon fishery, with the whale, fur seal, and cod fisheries playing less important roles. Resource exploitation in the Pacific Northwest, however was hindered by relative isolation and the absence of a large population base. Nevertheless, interest was expressed in the abundance of the region's resources and the fishing industry was amongst the first to benefit from speculative investment. Following the establishment of the first salmon cannery on the Sacramento River in 1860, expansion of the industry northwards to Oregon, Washington, British Columbia, and Alaska occurred at a fairly rapid rate. By 1896, 54 canneries were operating in British Columbia. Because salmon were initially salted, and later canned, following innovations in canning, the industry did not depend so heavily on efficient and fast modes of transportation as was to be the case with the developing fresh halibut fishery.
Development of the halibut fishery on a large commercial scale was not possible prior to the completion of railway links to Pacific coast points such as Vancouver, Seattle, and Tacoma between 1885 and 1892. Only then was it possible to move large volumes of fresh halibut to the large fish markets in the eastern cities of North America. Consequently, the halibut fishery before 1888 did not exist as an independent sector of the region's fishing industry. Insignificant landings of halibut which were being made constituted incidental catches made by fishermen engaged in other sectors of the fishing industry. Attempts were made, however, to develop the halibut fishery on a small scale. For example in 1880 an American vessel was sent from San Francisco to Sitka, Alaska to fish for halibut. These early attempts did not succeed because of limited markets in the coastal cities and competition from other food fishes of the region.

The first commercial landings of Pacific halibut were made in 1888 by halibut vessels from the New England halibut fishery. Depletion of the Atlantic halibut fishery was occurring at this time. According to Thompson and Freeman the owner of two halibut schooners at Gloucester, Massachusetts responded to letters in the local newspaper expounding upon the opportunities of sealing and halibut fishing in the Pacific region. By 1888 three New England schooners had arrived at Seattle and engaged in the Pacific halibut fishery. From such initial endeavour the fishery had its beginnings. As will be shown in the following chapter, there were many problems to be overcome in the initial development of the fishery. These related to competition, high fishing costs, and relatively low halibut prices. Nevertheless, the fishery was to expand at a fairly rapid pace, and developed into an integral sector of the Pacific Northwest fishing industry.
References


7. Ibid. p. 63


10. Information supplied by Mr. Frank Compantino, Manager. Booth Fisheries Ltd., Prince Rupert.


Chapter III
Spatial Confinement and Resource Depletion 1888-1912

The overall aim of this chapter is to trace the initial development of the Eastern Pacific halibut fishery. Factors contributing to the early growth of the fishery and the characteristics of the fishing complex which evolved will be analysed. It will be shown that this was an unregulated phase resulting in heavy, successive exhaustion of fishing grounds causing major northerly shifts in the catching and landing/processing sectors of the industry. During this period virtually all catches were taken on grounds between Cape Flattery, Washington and Cape Spencer in Southeast Alaska, a distance of approximately 600 miles. In this period, Washington received the greatest percentage of the halibut catch (61%), followed by British Columbia (33%), and Alaska with 6% of total average annual landings amounting to 21.5 million pounds. Between 1888 and 1912 the catch increased from 1.4 million to 60.4 million pounds. Seattle developed into the leading halibut centre on the coast, followed by Vancouver in British Columbia and, towards the end of the period, Ketchikan, Alaska commenced to play an important role. Small landings of halibut were also made at a large number of smaller fishing centres throughout the region. In essence, this phase of the fishery was restricted to near-shore waters and the spatial extension of the catching and processing sectors was hindered by technological and market constraints. By the end of the period, nevertheless, all major halibut grounds south of Cape Spencer were exposed to overfishing and speculative investment was continuing in the industry.

Spatial Structure

Figure 7 shows the general spatial structure of the Pacific halibut
Legend

△ RAILHEAD LOCATION PORTS
■ COLD STORAGE FACILITIES
○ SECONDARY PORTS
● FISHING STATIONS (MINOR PORTS)
| LIMIT OF FISHING OPERATIONS
→ RANGE OF FISHING VESSELS
  BASED AT EACH PORT TYPE
← VESSELS ELECT TO LAND PART OF YEARLY CATCH
   AWAY FROM HOME PORT

FIGURE 7. SPATIAL STRUCTURE OF THE INDUSTRY 1888–1912.
fishery during the period. It was characterized by a relatively large number of fishing ports of varying importance. The range of the catching sector was restricted to fishing grounds near these ports. The railhead ports, however, supported vessels with a much greater range and they played a dominant role within the industry. Since the entire catch was marketed via the railhead ports, there was considerable re-routing of halibut landings to these locations. Figure 8 shows that there was a high degree of centralization associated with primary halibut landings by port.

Initial commercial exploitation of the halibut stocks took place with the development of fishing grounds in the vicinity of Cape Flattery, Washington in 1888, but by 1895 operations had extended as far north as Cape Spencer in Southeast Alaska. Despite the rapid northward extension of the boundary of the catching area, Vancouver and Seattle developed into the leading halibut ports of the region. Average annual halibut catches during the period amounted to 21.5 million pounds, and by the end of the period most of the catch was being taken north of Vancouver Island, but south of Cape Spencer. The grounds close to the major ports were heavily fished in the initial years of the fishery. As a result effort was diverted to the more productive grounds further north.

The small boat sector of the industry which operated from the smaller ports and fishing stations fished the near shore grounds. The larger, more highly mobile vessels operating from Seattle, Tacoma, and Vancouver concentrated their effort over all sectors of grounds in response to resource availability. Linkages between the catching sector of the industry and the major landing, processing/marketing centres remained strong even after depletion of the smaller southern grounds.
SIZE OF THE SQUARE PROPORTIONAL TO AVERAGE ANNUAL LANDINGS FOR THE PERIOD
ONE QUARTER INCH SQUARE EQUALS 8 MILLION POUNDS

FIGURE 8. DEGREE OF CENTRALIZATION OF HALIBUT LANDINGS 1888–1912.
A large percentage of the catch landed at Seattle, Tacoma, and Vancouver was made by steamers from the company-owned fleets. By 1907 the steamer fleet numbered 15 vessels compared to approximately 75 independent (fishermen-owned) schooners and each fleet landed approximately 25 million pounds of halibut. Vancouver was headquarters for 6 of the steamers, Seattle supported a fleet of 5 steamers and most of the independent schooners, and Tacoma was headquarters for four steamers. With increased northward extension of fishing effort, there was increased tendency for vessels in the independent fleet to land catches at northern locations such as Taku, Petersburg, and Ketchikan. The larger company steamers were faster and more mobile than the sailing schooners, permitting them to fish in distant waters but to land their catch at home port. This partially accounts for the larger ports being able to maintain their dominant positions in the industry.

The northward extension of fishing operations was accompanied by the establishment of cold storage facilities close to the major halibut grounds in northern British Columbia and Southeast Alaska waters. A small cold storage plant (using glacier ice) was established at Taku, Alaska in 1902. Later plants were established at Ketchikan (1909), Pacofi (1909), and at Kildonan on the west coast of Vancouver Island in 1911. Landings of halibut at these locations, apart from Ketchikan were relatively small because the railhead ports of Seattle, Vancouver, and Tacoma offered higher prices. In addition, the small boat sector expended far less effort and accounted for a fraction of the total catch. Cold storage facilities were constructed at Prince Rupert in 1912 ahead of a railway link to that port. It was not until the second phase of the fishery that northern ports were to play a more important role in the fishery.
Figure 10 shows the distribution of average annual landings throughout the 1888-1912 period. The dominant positions of ports at railhead locations on Puget Sound and the Lower Mainland reflect the strong orientation between the catching and landing/marketing sector of the halibut industry. Apart from limited production of smoked and fletched (salted) halibut, the entire catch was marketed in a fresh or fresh-frozen form. This required centralization of cold storage and marketing facilities at the railhead centres on the coast in order to make for fast and efficient movement of halibut to eastern markets. Average annual landings at ports on Puget Sound (principally Seattle) amounted to 13.5 million pounds compared with 5.9 million pounds for Lower Mainland ports (mainly Vancouver). In addition, these ports were entry points for halibut landed in Alaska, which was marketed in eastern markets as well.

In the initial phase of the fishery the Washington halibut fleet expanded at a much faster rate than the British Columbian and Alaskan fleets. As a result Washington accounted for the largest proportion of the catch, followed by British Columbia and Alaska respectively. Figure 11 shows the trend in landings for each of these regions. Towards the end of the period Washington ports were losing ground to both British Columbia and Alaska ports. The decision in 1894 by the New England Fishing Company, one of the largest American fishing companies, to make Vancouver its western headquarters, and the subsequent use of highly efficient steamers by the company, contributed to early growth of the port's role in the fishery. Vancouver, however, did not support a large independent fleet like that of Seattle, and this was to affect the former's role in the second phase of the fishery.
FIGURE 10. AVERAGE ANNUAL LANDINGS (MILLIONS OF POUNDS) BY PORT AREA 1888—1912.
PORT AREAS INCLUDE: PUGET SOUND, LOWER MAINLAND, VANCOUVER ISLAND, NORTH CENTRAL BRITISH COLUMBIA, NORTHERN BRITISH COLUMBIA, SOUTHEAST ALASKA AND WEST CENTRAL ALASKA.
FIGURE 11. TREND IN LANDINGS BY REGION 1888-1912.

CATCH (MILLIONS OF POUNDS)

YEARELY CATCH
LANDED IN WASHINGTON
LANDED IN BRITISH COLUMBIA
LANDED IN ALASKA
Halibut landings made outside the major port areas were dependent on either a packer or freighter system to deliver catches to holding units and the railhead ports. In Alaska, for example, packers would collect halibut deliveries made to the small-boat fishing stations throughout Southeast Alaska and deliver them to Petersburg for delivery south by freighter. Incidental landings of halibut were also made at the various salmon cannery sites throughout the region. During the 1888-1912 period, average annual landings for Vancouver Island amounted to 607 thousand pounds, and were taken mainly by the small boat sector operating from fishing stations and villages such as Kildonan. In the early years of the fishery, Victoria was headquarters for several halibut vessels which landed their catches at that port. From there they were shipped east via the railhead at Tacoma.

Butedale, in north central British Columbia, developed into an important salmon centre after the turn of the century. Incidental landings of halibut were also made at Butedale because it was equipped with holding facilities and was near the major halibut grounds in north central British Columbia waters. Elsewhere along this section of the coast a small boat fishery was carried out by whites and Indians, mainly in inside inlets. The area south of Hecate Strait and north of Cape Caution accounted for approximately 473 thousand pounds annually during the 1888-1912 period. Incidental landings of halibut were also made at a number of small fishing stations in the vicinity of the Queen Charlotte Islands, but it was not until after 1912 that this was to develop into a major landing sector of the industry. A small cold storage was constructed at Hayesport, a few miles south of Prince Rupert in 1911, and from there halibut landings were sent to Vancouver
for final marketing.

By 1901 the Alaska-based fleet numbered 20 small schooners and sloops. In addition, a number of vessels from the Puget Sound independent fleet fished in Alaska waters and landed part of their catches at ports and fishing stations there. Development of the halibut fishery in Southeast Alaska proceeded in the same manner as in the isolated areas to the south. It was essentially a shore based fishery carried out in small boats from a number of shore stations. The larger, and more important stations were Douglas, Wrangell Narrows, Taku, and Petersburg. An increase in the size of the Puget Sound independent fleet after 1901 led to increased fishing activity in Alaskan waters by these vessels. After the construction of cold storage facilities at Ketchikan in 1909, increased landings occurred in Southeast Alaska, and the port commenced to play an important role in the fishery. By 1912, landings at Alaska ports totalled 10.3 million pounds. Although a floating cold storage plant was stationed at Kodiak in 1912, the experiment failed. It was not until after a large number of vessels had shifted their effort to the west side of the Gulf of Alaska in the second phase of development, did West Central Alaska play a role in halibut landings.

Increased demand in eastern markets, less competition from Atlantic halibut, and improvements in rail transport led to rapid expansion of the industry after 1905. This was reflected in increased halibut prices, an increase in the size and number of vessels in the independent and company-owned fleets, expansion of the cold storage sector away from Puget Sound and the Lower Mainland, and greatly increased production. The increased use of powered vessels in the final years of the period greatly increased mobility within the independent halibut fleet. They
were, however, expensive to operate because of the high costs of gasoline, and as a result their economic fishing range was limited. Nevertheless, the catching sector of the industry was in a better position to cope with expansion to new grounds and to support the developing cold storage sector at points closer to the more prolific halibut grounds in northern waters.

**Functional Structure**

The initial phase of the industry was characterized by a functional structure consisting of three distinct patterns: (1) the small boat sector operating mainly from small fishing stations, (2) the larger independent dory fleet based primarily at Seattle, and the company owned steamer fleet based at Seattle, Tacoma, and Vancouver. Figure 12 shows the structure of the industry during the 1888-1912 period and the flow patterns associated with each catching sector of the industry.

The independent dory vessels from Puget Sound ports were the first vessels to engage in the halibut fishery on the Pacific Coast. In the early years of the fishery they confined fishing activity to near-shore grounds over which fishing operations were conducted from dories. Their catch was then taken directly to such ports as Seattle and Tacoma and sold by auction on the halibut exchange. With depletion of the southern grounds, however, these sailing vessels were forced to go further north. Since they did not have sufficient speed to deliver all their catches to the major railhead ports, they landed part of their catch at ports in Southeast Alaska. These landings were moved by packer to the major freighter ports of Petersburg and Ketchikan, and then were shipped in a fresh or fresh-frozen form to the southern
1. STRUCTURE OF THE COMPANY-OWNED FLEET

2. STRUCTURE OF THE INDEPENDENT DORY VESSEL FLEET

3. STRUCTURE OF THE SMALL BOAT FLEET

railhead locations. Here the transshipped halibut was either placed in cold storage or shipped directly to market.

The small boat sector of the industry commenced to play a role in the halibut fishery soon after commercial fishing started in 1888. Vessels in this sector were generally less than five tons and confined their fishing operations to grounds less than ten miles from shore. In the early years they fished the waters in the vicinity of Cape Flattery and southern Vancouver Island, and delivered their catches to such ports as Seattle, Tacoma, Bellingham, Port Townsend, and Victoria. With increased depletion of these grounds this sector of the fishery declined in the area, but it continued to play a significant role in northern areas until a much later date. These small vessels generally confined their operations to the more isolated areas of the coast. As a result this sector of the fishery relied heavily on storage facilities at isolated ports, and a packer system to transport landings to the major marketing points. The major northern ports supported a small boat fishery as well, but grounds close to these ports were soon depleted, and it was no longer possible for the small boat sector to engage in fishing operations.

The company-owned vessels were introduced into the fishery in 1898, the companies having chartered coastal freighters which were converted for the fishery prior to that date. They were based at the railhead centres and conducted operations all along the coastline as far north as Cape Spencer. Because of their large carrying capacities (approximately 200-300,000 pounds) and considerable range they were more highly mobile than the independent dory and small boat fleets. Fishing operations were conducted from dories carried by the streamers
and were restricted to waters short distances from the mother ship. These large steamers rarely landed their catch away from the railhead ports, and as a result the larger ports were assured of halibut landings for as long as they were headquarters for the steamer fleet. Unlike the independent vessels, the company-owned vessels delivered their catch directly to cold storages and plants operated by individual companies, and bypassed the halibut exchange. Major firms engaged in the halibut trade invested in steamers to assure adequate supplies of halibut for the cold storage sector. In the early phase of the fishery the independent fleet could not produce the quantities of halibut required by the various firms, nor could they supply halibut at a competitive price.

The pattern of landings depicted in Figure 10 was therefore a function of the catching and landing practices of the various fleet sectors. The independent dory fleet and the company-owned steamer fleet landed virtually the entire catch and concentrated their landings at Puget Sound and Lower Mainland ports, and to a lesser extent, Ketchikan. The small boat sector on the other hand landed its catch at smaller ports throughout the region. Because vessels in this sector were less efficient than vessels in the other sectors they accounted for only a fraction of the total catch.

Factors Affecting Initial Development

Investment capital for development of primary resources in the Pacific Northwest came mainly from Great Britain, eastern Canada, and the eastern United States. In the case of the Washington and Alaska fisheries, capital for fisheries development came from the established
fishing companies of New England, and to a lesser extent San Francisco. The early halibut fishery in British Columbia was dominated by the New England Fishing Company of Boston, but investment in the salmon sector came primarily from eastern Canadian and British circles.

Since the marketing sector of the Pacific halibut fishery was controlled by companies who were also the leading factors in the Atlantic halibut fishery, this had some bearing upon the slow growth of the former up to 1904 at least. The possibility of having the eastern markets flooded with low-priced Pacific halibut when Atlantic halibut prices were reaching 20 cents per pound was reason to protect their investment in the Atlantic fishery. In the first ten to fifteen years of the Pacific fishery, investment in the region's halibut industry was far less than accumulated investment in the New England halibut fishery. By 1904, the Atlantic halibut catch had reached an all time low, having dropped from a peak of 14.6 million pounds in 1879 to approximately 4 million pounds. It was only then that company investment in the Pacific fishery increased. For example, the number of company-owned steamers increased from 5 in 1904 to 14 in 1905.

These steamers were extremely effective and were accounting for approximately fifty percent of the total catch even by 1912. In fact, heavy landings by the steamers tended to flood the market thereby depressing halibut prices, and had an adverse effect on expansion of the independent fleet. Unstable markets in the early period made it difficult for the non-company vessels to compete with the larger and more highly efficient company steamers. In terms of capital requirements, much more capital was required for vessels in the catching sector of the
halibut fishery than for the salmon fishery. The halibut fishery developed into a deep-sea fishery after 1910, but the salmon industry continued to confine operations to near-shore waters. Despite a shortage of capital for construction of vessels in the independent fleet, the economic opportunity provided by expansion to new grounds after 1912, overcame this constraint and there was a rapid increase in the number of privately-owned vessels.\textsuperscript{23}

Development of the halibut fishery on a large commercial scale was not possible prior to the completion of railway lines to Pacific coast points in the eighteen eighties. Only then was it possible to move large volumes of fresh halibut to the large fish markets in the eastern cities. The relatively small population of the western seaboard could not absorb any extensive halibut catches.\textsuperscript{24} The catch increased from 1.4 million pounds in 1888 to 4.2 million pounds in 1895, but the catching sector of the industry was capable of producing far greater quantities. This was not possible because the industry faced extreme competition. Local markets were small and most of the demand was located in the large urban centres of the east in Chicago, New York, Boston, etc. Therefore, the survival and expansion of the Pacific halibut fishery was dependent on markets three thousand or more miles away.

Competition from the New England supply of halibut and eastern groundfish production did not make possible a year round fishery before 1900. Instead, the Pacific halibut fishery was only conducted during the winter months when the Atlantic halibut fishery was less intensively pursued. This resulted in increased demand for Pacific halibut and high enough prices to make it economically worthwhile for vessels to engage in the fishery. Before 1900, it was often the case where incidental
summer catches of Pacific halibut could not find wholesale buyers in the region because low prices combined with high transportation costs did not make it an economical undertaking.

The rapid increase in the number of company vessels together with expansion of the independent fleet resulted in over-capacity within the catching sector. The total catch increased at a faster rate than demand after 1905. As a result, prices were kept low (around three cents per pound), especially during the summer months when the greatest part of the catch was taken. Even the number of available refrigerator cars was to have a bearing upon price fluctuations. With heavy landings on any given day combined with a shortage of cars to deliver halibut, prices dropped and vice versa. In fact, this was always to be an interesting aspect of the halibut industry, but to a lesser degree in recent years. Halibut which could not be forwarded directly to market in a fresh form had to be placed in cold storage and brought lower prices at dockside.

Another interesting factor related to early growth of the Pacific halibut fishery was the cost of ice. Ice was required to preserve catches at sea and especially before 1895 to preserve halibut on their long journey to eastern markets. The prohibitive cost of ice -- fifteen dollars per ton at Seattle in 1888 -- combined with extremely low halibut prices prevented a large number of independent vessels from entering the fishery. The large carrying capacities of company-owned steamers together with greater financial backing made it possible for the company-owned fleets to engage in the fishery more profitably. The early development of the halibut fishery in Southeast Alaska, was in part, related to the relative scarcity and high price of ice in Washington and British Columbia. Vessels proceeded north to Alaska to secure
supplies of glacier ice, and there was consideration given to moving large volumes of ice from Alaska to the railhead centres of the South. After the construction of increased numbers of ice making and cold storage plants and subsequent expansion of the fishery, lower production costs per unit volume decreased the price of ice. This made it possible for greater numbers of independent vessels to engage in the fishery.

Relative improvement of market conditions after 1905 resulted in increased landings of halibut, and heavy, successive exhaustion of grounds from Cape Flattery to Cape Spencer. The period ended with the catch reaching 60.4 million pounds in 1912, and much speculative investment being injected into the industry, especially at Prince Rupert. In essence, the period was characterized by the presence of large companies within the industry. Corporate involvement in the Pacific halibut fishery in its early phase was essential to the development of an infrastructure (cold storages, ice plants, marketing techniques, etc.) around which the fishery could develop and expand.

Extent of Fishing

The extent of fishing grounds which could support the expanding halibut fishery in the 1888-1912 period was limited to the generally small banks south of Cape Spencer, Alaska. The much larger banks in the Gulf of Alaska and westwards were to be exploited at a later date when high vessel operating costs and technological and market constraints were overcome.

In the initial years of the developing fishery, the fishing grounds most intensely fished were those in near-shore waters off Cape Flattery and southern British Columbia. Depletion of these grounds occurred rather quickly because of heavy fishing pressure and no fishing restrictions.
As a result, expansion to grounds away from Seattle, Tacoma, Port Townsend, and Vancouver took place from 1900 onwards. Smaller halibut centres such as Port Townsend, Bellingham, Fairhaven, and Whatcom on Puget Sound were not as conveniently located as the larger ports, nor did they have the facilities to handle the greatly increased catches after the turn of the century. Consequently, these smaller ports no longer played a significant role in the fishery.

Until 1909, fishing for halibut was carried out in approximately 35 fathoms of water during the summer months and slightly greater depths during the winter months. With increased depletion of stocks on inshore grounds, the offshore halibut grounds came under more intensive fishing. It was not until 1910 that fishing was carried out in depths exceeding 100 fathoms, and the deeper waters off the west coast of the Queen Charlotte Islands were first exploited in the 1910-1911 fishing season. Prior to 1909 large catches were possible on inshore grounds, but the movement to deeper water reflected stock declines. This coincided with the addition of larger and more highly mobile vessels to the independent fleet. From 1909 onwards, however, increased Canadian surveillance of its three mile fishing limit contributed to American vessels moving to offshore grounds.

Towards the end of the 1888-1912 period, competition for declining fishing stocks on the southern grounds increased greatly. Table 1 shows the trends in catch, effort, and yield for the final years of the period. Although the catch increased slightly, there occurred a sharp decrease in yield per unit of effort. The increase in effort reflected an increase in the number of vessels entering the fishery, and greater amounts of effort which were required to take relatively stable catches. Catches were being maintained at higher costs than previously was the case.
Table 1
Trends in Yield, Landings, Effort 1907-1912.

<table>
<thead>
<tr>
<th>Year</th>
<th>Catch per Skate (Pounds)</th>
<th>Landings (Pounds)</th>
<th>Number of Skates Fished</th>
</tr>
</thead>
<tbody>
<tr>
<td>1907</td>
<td>280.0</td>
<td>50,000,000</td>
<td>178,571</td>
</tr>
<tr>
<td>1910</td>
<td>271.0</td>
<td>51,849,240</td>
<td>191,325</td>
</tr>
<tr>
<td>1911</td>
<td>237.0</td>
<td>56,931,796</td>
<td>240,219</td>
</tr>
<tr>
<td>1912</td>
<td>176.0</td>
<td>60,479,550</td>
<td>343,066</td>
</tr>
</tbody>
</table>

Source: Report No. 8. IFC

By the end of the second period, all major halibut grounds south of Cape Spencer were subjected to overfishing and had surpassed their maximum sustainable yield levels. Only small, isolated patches of grounds remained undiscovered. General improvements in vessel design and engine power resulted in more efficient and larger vessels being added to the fleet. Consequently, this had an adverse effect not only on halibut stocks but also on returns to fishermen engaged in the fishery.

Increased annual catches were only possible as the result of increased effort and the constant shift to new grounds. To compensate for declining yields fishermen not only employed greater amounts of gear but also resorted to longer hours of fishing. For example, in the case of the company-owned vessels, the average time spent fishing per trip increased from 3.4 days in 1906 to 8.9 days in 1912. Over the same period the average catch declined from 135,300 pounds per trip in 1906 to 97,355 pounds per trip in 1912. Most of the halibut which continued to be taken consisted of smaller, lower-priced fish, the larger fish having been removed by overfishing.

Besides increases in effort, other factors affected the depletion of the grounds south of Cape Spencer. These included: the limited
extent of fishing grounds, the removal of large numbers of female fish, the late maturity of female fish, the slow rate of growth of different age classes in the halibut population, and the presence of large numbers of larger fish in the virgin stocks which were easily susceptible to increased fishing pressure. The limited halibut stocks were not capable of withstanding the fishing effort which was brought to bear upon them. Improvements in catching methods and greater familiarity with the various grounds by the fishermen were additional factors which led to severe depletion of halibut grounds. As will be seen, the shift to western grounds in the second phase of the fishery brought only temporary relief from these problems and resource depletion soon reoccurred.
References


5. Ibid. p. 63


15. Ibid. p. 40

16. Ibid. p. 27.

21. Thompson, W. F. And N. L. Freeman. op. cit. p. 46.
25. Ibid. p. 15
26. Ibid. p. 62
27. Thompson, W. F. And N. L. Freeman. op. cit. p. 36.
30. Ibid. p. 31
35. Ibid. p. S137
Chapter IV
Shift to Western Grounds and Fleet Expansion 1913-1931.

The main objective of Chapter IV is to account for changes in the spatial structure of the halibut industry during the 1913-1931 period arising from resource depletion in the initial phase of the fishery and further expansion of the industry. The period was characterized by more intensive fishing on grounds south of Cape Spencer and a westward shift into the Gulf of Alaska. This contributed to the development and expansion of major landing/processing and marketing ports in northern British Columbia at Prince Rupert, and to a lesser extent at Ketchikan in Southeast Alaska. In addition, a number of smaller ports of British Columbia and Alaska were to play a more significant role in the halibut industry.

A downward trend in landings at the major southern ports of Seattle, Tacoma, and Vancouver occurred. Nevertheless, Seattle retained its early pre-eminence and emerged as one of the two dominant halibut ports of the region. Prince Rupert replaced Vancouver as the major halibut port in British Columbia and landings at the former greatly exceeded those at Seattle. During the 1913-1931 period a large percentage of the catch was taken from grounds west of Cape Spencer which had remained unexploited during the initial phase of the fishery. Throughout most of the second period there was an increased tendency for vessels to land their catch at ports relatively close to the major fishing grounds in northern British Columbia and Alaska waters. This was perpetuated by the growth and expansion of the independent halibut fleet, the decline of the company-owned fleet, and extension of cold storage facilities. In essence, the 1913-1931 period was characterized by continued expansion of the industry and decentralization of the producing, catching, and landing/processing
sectors of the fishery.

Spatial Structure

The initial phase of the halibut fishery (1888-1912) was shown in Chapter III to be characterized by a relatively high degree of centralization within all sectors of the industry. All halibut were taken on grounds south of Cape Spencer and Seattle and Vancouver were dominant as headquarters and bases of operation for the halibut fleet and for the marketing of the entire catch. Between them they accounted for approximately 88% of all direct landings of halibut. It was only towards the end of the first period that Ketchikan began to take on an important role in the halibut fishery. The infrastructure of the industry had developed to a stage at which large quantities of halibut could be supplied to eastern markets at competitive prices.

Figure 13 shows the general spatial structure of the Pacific halibut industry during the 1913-1931 period. Fishing operations were conducted over a much greater area than was the case in the initial period. The range of the catching sector had increased greatly, and the role of the small boat fishery declined sharply. Much of the activity associated with the exploitation of the halibut resource west of Cape Spencer became diverted to the newly completed railway terminus at Prince Rupert. A number of important secondary ports also developed in Southeast Alaska. In West Central Alaska, to which an increasing amount of fishing activity was directed, secondary ports did not develop significantly. In the first phase of the fishery only a small part of the catch was landed at ports away from the various home ports of the fishing vessels. In the second phase, however, vessels were electing to land a large share of the catch.
RAILHEAD LOCATION PORTS
SECONDARY PORTS
FISHING STATIONS (MINOR PORTS)
COLD STORAGE FACILITIES
LIMIT OF FISHING OPERATIONS
RANGE OF FISHING VESSELS
BASED AT EACH PORT TYPE
VESSELS ELECT TO LAND PART OF YEARLY CATCH
AWAY FROM HOME PORT

away from home port on Puget Sound and the Lower Mainland. In addition, independent halibut fleets developed away from the major ports to the south.

Figure 14 shows a considerable degree of decentralization in the overall structure of the industry during the 1913-1931 period. The increase in catch from grounds west of Cape Spencer resulted in increased halibut landings in northern British Columbia and Southeast Alaska. Whereas in the 1888-1912 period Washington ports received 61% of average annual landings, its share decreased to 31% in the 1913-1931 period. British Columbia and Alaska ports increased their share from 33% and 5% respectively to 52% and 17% over the two periods. This reflected the increased tendency for vessels to land their catches near the major producing grounds.

Figure 15 shows the extent of fishing on the halibut grounds of the Eastern Pacific and catches from various sectors of the grounds during the 1913-1931 period. Production from the newly exploited grounds increased from an insignificant amount in 1912 to 21.6 million pounds in 1931. Throughout the period as a whole average annual landings from the western grounds totalled 21.2 million pounds, or 41% of total average annual landings. The increase from grounds west of Cape Spencer (Area 3) was offset by a large decline on grounds south of Cape Spencer (Area 2) from 59.5 million pounds in 1912 to 21.6 million pounds in 1931.

The northwestward shift in landings resulted in the weakening of the Puget Sound and Lower Mainland port roles in the halibut industry. Although average annual landings for the industry increased from approximately 21.5 million pounds in the 1888-1912 period to 48.8 million pounds in the 1913-1931 period, those of Puget Sound only increased from 13.5
WEST CENTRAL ALASKA PORTS

SIZE OF THE SQUARE PROPORTIONAL TO AVERAGE ANNUAL LANDINGS FOR THE PERIOD.
ONE QUARTER INCH SQUARE EQUALS 8 MILLION POUNDS

OTHER PORTS

KETCHIKAN

SOUTHEAST ALASKA
(EXC'L KETCHIKAN)

PRINCE RUPERT

SEATTLE

VANCOUVER

FIGURE 15. AVERAGE ANNUAL CATCH FROM VARIOUS GROUNDS 1913–1931.
to 15.0 million pounds over the same two periods. Average annual landings on the Lower Mainland decreased from 5.9 to 3.0 million pounds. The most significant change in the pattern of landings was brought on by the attraction offered by the railhead terminus at Prince Rupert. Table II shows the average annual landings by port area for each of the two periods. The westward trend in landings outside the established port areas is quite apparent (Figure 16).

Table II

Average Annual Halibut Landings by Port Area
During the 1888-1912 and 1913-1931 Periods
(000 lbs.)

<table>
<thead>
<tr>
<th>Period</th>
<th>P. Sound</th>
<th>Lower Van</th>
<th>Cen. BC</th>
<th>Nor BC</th>
<th>SE Alaska</th>
<th>WC Alaska</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>1888-1912</td>
<td>13519</td>
<td>5905</td>
<td>607</td>
<td>473</td>
<td>89</td>
<td>1000</td>
<td>21593</td>
</tr>
<tr>
<td>1913-1931</td>
<td>15046</td>
<td>3078</td>
<td>652</td>
<td>1140</td>
<td>18776</td>
<td>9619</td>
<td>1163</td>
</tr>
</tbody>
</table>

Figure 17 shows the trends in landings for Washington, British Columbia, and Alaska during the 1913-1931 period and for the region as a whole. The upward trend in Washington landings towards the end of the period reflected decreasing halibut prices between 1926 and 1931. For example, the average landed price of halibut in British Columbia decreased from 13 cents per pound in 1926 to 6 cents per pound in 1931. As a result, most of the Seattle-based vessels landed an increased share of their catch at Seattle where slightly higher prices prevailed.

Decentralization of landings throughout the Pacific Northwest, the northwestward movement of the catching sector, and the completion of a
FIGURE 17 TREND IN LANDINGS BY REGION 1913–1931.

CATCH
(MILLIONS OF POUNDS)

1913 1918 1923 1928 1931

YEARLY CATCH
LANDED IN WASHINGTON
LANDED IN BRITISH COLUMBIA
LANDED IN ALASKA
rail link to Prince Rupert in 1914 were the main factors which promoted the development of cold storage and port facilities away from the established ports. Following the westward shift to new grounds after 1912, ports in northern British Columbia and Southeast Alaska took on a more prominent role in the halibut industry. This was also accompanied by a larger number of companies engaging in the halibut trade.

Despite the increase in the number of important halibut centres, two centres continued to dominate landings: Prince Rupert, which replaced Vancouver as the main halibut port in British Columbia and became the main landing port in the Eastern Pacific, and Seattle. In 1915 the United States and Canada reached an agreement whereby American vessels were permitted to sell their catch to Prince Rupert buyers, who in turn could then process and transship the halibut to United States markets in bond. The effect of this agreement may be seen in the fact that landings of halibut by American vessels at Prince Rupert increased from 7.1 million pounds in 1915 to 22.1 million pounds by 1925.

By the end of the second period each of the major sub-regions had developed an important halibut centre. This resulted in the tendency toward a more even distribution of landings throughout the entire region. Fleet reaction to spatial expansion of the fishery was to favour landing ports near the fishing grounds, but only if prices were competitive with those at Seattle and Vancouver. Halibut prices paid at Prince Rupert were highly competitive and this explains the strong showing of Prince Rupert during the 1913-1931 period. Because the Seattle and Vancouver based fleets consisted of larger vessels than the fleets which developed to the north, they were in a better position to deliver catches to ports
which offered better price advantages. The smaller vessels, however, were indirectly forced to sell their catches at the ports from which they operated. The importance of each node was a function of proximity to fishing grounds, the size and number of the vessels operating from it, and the price paid for halibut at each port.

Table III shows the yearly landings of halibut at the more important halibut ports during the 1913-1931 period. The dominant positions of Prince Rupert and Seattle are quite apparent, with a major shift occurring in halibut landings away from the latter after 1915 when Prince Rupert became the dominant port in the industry. Generally, any decreases in Seattle landings were captured by Prince Rupert, and vice versa. Essentially, the role of Vancouver and Tacoma in the industry declined with the passing of the company-owned fleets. Both these ports had not developed as large independent fleets as Seattle or Prince Rupert, and were heavily dependent on company vessel landings.

One of the most striking features of the period was the increase in halibut landings outside the major ports, especially at Southeast Alaska locations. Such ports as Sitka, Juneau, and Petersburg had acquired cold storage facilities towards the end of the first period and at the beginning of the second period. They were therefore in a position to capture a significant proportion of the catch that otherwise would have gone to such ports as Ketchikan. These ports developed their own small independent fleets during the second period which landed their catches primarily at home port. With increased expansion to grounds on the west side of the Gulf of Alaska after 1923, Seward accounted for considerable landings as well. Therefore, by the end of the period fishing activity was being carried out approximately 2500 miles from Seattle and Vancouver.
### Table III

Halibut Landings at Major Ports 1913-1931 (‘000 lbs.)

<table>
<thead>
<tr>
<th>Year</th>
<th>Seattle</th>
<th>Vancouver</th>
<th>Butedale</th>
<th>Prince Rupert</th>
<th>Ketchikan</th>
<th>Sitka</th>
<th>Wrangell</th>
<th>Juneau</th>
<th>Taku</th>
<th>Petersburg</th>
<th>Seward</th>
</tr>
</thead>
<tbody>
<tr>
<td>1913</td>
<td>9368</td>
<td>--</td>
<td>--</td>
<td>10749</td>
<td>--</td>
<td>--</td>
<td>1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1914</td>
<td>35520</td>
<td>7851</td>
<td>--</td>
<td>8742 (3106)</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1915</td>
<td>27906</td>
<td>9714</td>
<td>--</td>
<td>16055</td>
<td>3632</td>
<td>1000</td>
<td>--</td>
<td>137</td>
<td>344</td>
<td>679</td>
<td>--</td>
</tr>
<tr>
<td>1916</td>
<td>16104</td>
<td>6486</td>
<td>--</td>
<td>19646</td>
<td>3326</td>
<td>1300</td>
<td>--</td>
<td>3</td>
<td>450</td>
<td>1570</td>
<td>--</td>
</tr>
<tr>
<td>1917</td>
<td>15592</td>
<td>3572</td>
<td>38</td>
<td>18709</td>
<td>3528</td>
<td>1508</td>
<td>50</td>
<td>65</td>
<td>243</td>
<td>900</td>
<td>--</td>
</tr>
<tr>
<td>1918</td>
<td>9932</td>
<td>1726</td>
<td>62</td>
<td>15658</td>
<td>4819</td>
<td>900</td>
<td>30</td>
<td>30</td>
<td>21</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1919</td>
<td>11400</td>
<td>2671</td>
<td>106</td>
<td>16887</td>
<td>4553</td>
<td>1600</td>
<td>25</td>
<td>130</td>
<td>165</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1920</td>
<td>12580</td>
<td>3184</td>
<td>16</td>
<td>19419</td>
<td>6197</td>
<td>2000</td>
<td>--</td>
<td>120</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1921</td>
<td>11795</td>
<td>4139</td>
<td>70</td>
<td>25212</td>
<td>6624</td>
<td>1800</td>
<td>--</td>
<td>51</td>
<td>--</td>
<td>1300</td>
<td>--</td>
</tr>
<tr>
<td>1922</td>
<td>9982</td>
<td>873</td>
<td>--</td>
<td>25665</td>
<td>2253</td>
<td>900</td>
<td>--</td>
<td>426</td>
<td>--</td>
<td>--</td>
<td>2000</td>
</tr>
<tr>
<td>1923</td>
<td>8218</td>
<td>961</td>
<td>212</td>
<td>28984</td>
<td>8006</td>
<td>1500</td>
<td>--</td>
<td>600</td>
<td>--</td>
<td>1559</td>
<td>--</td>
</tr>
<tr>
<td>1924</td>
<td>7378</td>
<td>803</td>
<td>385</td>
<td>28252</td>
<td>7331</td>
<td>2000</td>
<td>600</td>
<td>600</td>
<td>253</td>
<td>1500</td>
<td>2049</td>
</tr>
<tr>
<td>1925</td>
<td>9676</td>
<td>862</td>
<td>221</td>
<td>28273</td>
<td>4297</td>
<td>2500</td>
<td>625</td>
<td>188</td>
<td>242</td>
<td>--</td>
<td>1432</td>
</tr>
<tr>
<td>1926</td>
<td>10080</td>
<td>710</td>
<td>243</td>
<td>26305</td>
<td>8808</td>
<td>1750</td>
<td>650</td>
<td>911</td>
<td>--</td>
<td>--</td>
<td>358</td>
</tr>
<tr>
<td>1927</td>
<td>11911</td>
<td>884</td>
<td>198</td>
<td>25062</td>
<td>8393</td>
<td>2250</td>
<td>500</td>
<td>960</td>
<td>200</td>
<td>1000</td>
<td>600</td>
</tr>
<tr>
<td>1928</td>
<td>13788</td>
<td>1241</td>
<td>235</td>
<td>28474</td>
<td>5037</td>
<td>1375</td>
<td>250</td>
<td>334</td>
<td>--</td>
<td>421</td>
<td>1200</td>
</tr>
<tr>
<td>1929</td>
<td>12359</td>
<td>894</td>
<td>146</td>
<td>28422</td>
<td>6060</td>
<td>967</td>
<td>250</td>
<td>1715</td>
<td>--</td>
<td>1972</td>
<td>1456</td>
</tr>
<tr>
<td>1930</td>
<td>12671</td>
<td>1138</td>
<td>139</td>
<td>23958</td>
<td>4975</td>
<td>1500</td>
<td>147</td>
<td>1216</td>
<td>--</td>
<td>907</td>
<td>1602</td>
</tr>
<tr>
<td>1931</td>
<td>15087</td>
<td>907</td>
<td>303</td>
<td>16792</td>
<td>5908</td>
<td>860</td>
<td>4</td>
<td>684</td>
<td>--</td>
<td>426</td>
<td>1133</td>
</tr>
</tbody>
</table>

Source: Pacific Fisherman (Yearbooks)
Halibut Commission Reports

- **1** Indicates information not available but landings do not vary significantly from yearly trends.

- **2** Landings at Seward relatively small before extensive development of western grounds.
and intervening ports had become important centres of activity associated with the exploitation of most halibut stocks.

**Functional Structure**

The 1888-1912 period was characterized by a functional structure consisting of three distinct operational patterns. In addition to these three, the second period saw further transformation in patterns of activity associated with the exploitation of the halibut resource. Figure 18 shows the additional link in the fishing complex which arose from the evolution of the longliner fleet.

Prior to 1913, longlining operations were carried out from dories over all sections of the halibut grounds. Both the company-owned fleet and the independent dory vessel fleet engaged in this type of fishing operation. By employing dories each vessel could fish larger amounts of gear in one day in suitable weather than was possible by fishing directly from the larger vessels. This was especially the case when fishing was being conducted in relatively shallow water where power gurdies were not required to retrieve the longlines. The move to offshore grounds and more treacherous waters in the Gulf of Alaska in 1913 resulted in fishing operations being carried out from the large vessels. As a result these vessels came to be known as 'longliners.' By the end of the period practically all vessels in the independent fleet had switched to this type of operation.

The move to longlining from vessels of a large size reduced man-power requirements in the catching sector of the industry. Dory fishing was a two man operation and if a vessel carried five dories it required
1. STRUCTURE OF THE COMPANY-OWNED FLEET

2. STRUCTURE OF THE INDEPENDENT DORY VESSEL FLEET

3. STRUCTURE OF THE INDEPENDENT LONGLINER FLEET

4. STRUCTURE OF THE SMALL BOAT FLEET

a crew of ten men in addition to the captain at least. In the new method of fishing fewer men were required. For example the average size crew per vessel of the Seattle based fleet in 1915 was ten men.\textsuperscript{13} By 1931 when virtually the entire catch was taken by longliners, the average crew size of the Seattle based fleet had declined to seven men.\textsuperscript{14}

In the open waters of the Gulf of Alaska in particular, less fishing time was lost because the longliners could carry out fishing operations in more adverse weather conditions than the dory fleet. Fishing costs were therefore reduced and earnings of individual crew members increased. In 1913 the entire halibut catch was taken from dories. By 1928, 93\% of the total catch was taken from longliners.\textsuperscript{15} The move to this type of fishing came with the move to offshore grounds and greatly facilitated exploitation of halibut stocks on the new grounds west of Cape Spencer.

Factors Contributing to Westward Extension

The maintenance of the high level of landings characteristic of the end of the first period required that fishing effort be directed to grounds west of Cape Spencer because the more southerly grounds had become severely depleted (Chapter III). However, for this relocation or shift to take place it was necessary that the range and efficiency of the vessels be increased and, further, that cold storage facilities be developed reasonably close to these grounds. All vessels in the halibut fleet were outfitted with gasoline engines by 1913, and as a result they could readily engage in fishing operations some distance west of Cape Spencer. Extension of cold storage facilities to northern locations and the
development of a railhead port at Prince Rupert made it economically possible to exploit western grounds. Large yields from the western banks in the initial years of westward expansion offset the added operating costs incurred in exploiting these banks.

As a result of westward expansion and an increase in total effort expended, halibut landings reached 68.7 million pounds in 1915. This figure was not to be surpassed until 1954 after measures had been taken to restore halibut stocks. Despite the rapid increase in total catch the available market for halibut was not capable of keeping pace with the potential productivity of the industry. Nevertheless, the increase in freezing capacity within the cold storage sector provided buyers with the means to over-purchase yearly supplies of halibut and encouraged the catching sector to maintain a high level of production. The result being that a larger proportion of the catch had to be placed in cold storage for longer periods. When catches were not moving from storage at a fast rate, prices for fresh halibut decreased, as was the case in the initial years of westward extension. For example, the average price paid for number one halibut at Seattle decreased from 8 cents per pound in 1913 to 4.7 cents per pound in 1914.  

The Pacific Fisherman stated that "It is very evident that there can be no permanent improvement in the halibut fishery unless the market for halibut is extended considerably or the output materially reduced."  

Anxiety on the part of the industry relating to over-production soon disappeared. Although expansion to grounds on the east side of the Gulf of Alaska resulted in a temporary increase in catch, production declined sharply during the war period despite a sharp increase in halibut prices. Landings dropped from 68.7 million pounds in 1915 to a low of
37.8 million pounds in 1918. The catch decline reflected continued depletion of halibut stocks because there was no overall reduction in effort. Food demands during the war, together with decreased catches and increased competition between buyers for decreased supplies of halibut led to an escalation of halibut prices. The average price paid for number one fish at Seattle increased from 4.7 cents per pound in 1914 to 18.3 cents per pound in 1918.

In anticipation of the port developing into a major seaport, much speculative investment occurred at Prince Rupert prior to the completion of the Grand Trunk Pacific Railway in 1914. Associated with this investment was the completion of a number of cold storage plants. One had a capacity in excess of 12 million pounds and was one of the largest in the world at that time. Much of the capital was British, and North Sea trawlers were brought out to supply the cold storage sector. The vessels were designed for trawling operations but this proved impractical and they switched to longlining. The development of fishing facilities at this northern railhead location greatly facilitated westward expansion because of its strategic position in relation to the major halibut grounds of the Eastern Pacific.

The rise of Prince Rupert as the leading halibut port was looked upon bitterly by Seattle and Ketchikan in particular. Because of its railhead location, Prince Rupert was in a position to capture a significant proportion of the entire catch since prices paid at the port were competitive with those at ports to the south. The former ports made representation to the United States government to have tariffs imposed on United States imported halibut from British Columbia but these attempts failed. Using the port as an operational and landing port, not only
could vessels fish the southern grounds, but they were also strategically
located to develop and exploit the western grounds as well. Ketchikan
was also conveniently located near the major grounds but because of
additional transportation costs incurred in transshipping halibut to
the railhead ports for final market destination, prices were lower than
those paid for halibut at Prince Rupert. As a result Ketchikan never
developed on the scale of Prince Rupert.

Although westward extension to the grounds on the east side of the
Gulf of Alaska commenced on a very intensive scale in 1913, the expensive
operating costs of the gasoline/distillate powered vessels still
hindered expansion to waters of the west side of the Gulf. After 1923,
with the advent of cheap operating costs and efficiency of the diesel
engine, exploitation of the banks on the west side of the Gulf of Alaska
expanded rapidly. Landings west of Cape St. Elias increased from 4.5
million pounds in 1922 to 17.8 million pounds in 1924.\textsuperscript{23} Longer trips at
far less cost were now economically possible. In addition, innovations
in freezing onboard vessels such as small freezing units and cork
insulated holds permitted fishing over a greater spatial range for
greater time durations. A fleet with a greater degree of mobility and
range had developed by the end of the second period than was the case in
the 1888-1912 period.

From Table III it can be seen that the increased catches from the
western grounds were landed mainly at northern British Columbia and
Southeast Alaska ports. Landings on Puget Sound remained fairly stable.
Whereas landings in west central Alaska were only a fraction of the halibut
catch taken in these waters. With decreased prices towards the end of
the 1913-1931 period, however, a greater number of American vessels with home port on Puget Sound found it more profitable to deliver catches to Seattle. Because of declining prices fishermen were less inclined to fish the far western grounds. Instead, they concentrated more effort on the southern grounds and elected to land their catch at home port.

Figure 19 shows the catch in millions of pounds, the total amount of gear fished in thousands of skates, and the catch per skate for Area 2 and Area 3 over the 1913-1931 period. Then general decline in yields continued on the southern grounds. On western grounds, the sharp decrease in catch per skate reflected the same pattern of depletion which occurred earlier on the banks south of Cape Spencer. Average yields per skate of gear in western waters decreased from 266 pounds in 1915 to 64.7 pounds in 1930, but the number of skates of gear fished increased from 88.9 thousand to 431.2 thousand. South of Cape Spencer, the average yields decreased from 118 pounds to 35 pounds over the same period and the number of skates of gear employed increased from 381.5 thousand to 616.3 thousand. The slight upward trends for both areas in 1931 was related to a considerable decline in effort because of very low prices being paid for halibut.

By the end of the 1913-1931 period the amount of effort expended was divided almost equally between Area 2 and Area 3. The greater amounts of gear fished on the southern banks was due to the larger number of vessels fishing these waters. In addition, fishermen were forced to employ more and more gear to compensate for declining halibut stocks. Although a closed fishing season between November 16 and February 15 was instituted in 1924 by the IFC, average yields continued to decrease. There is no conclusive evidence that the sharp decrease in halibut landings after 1915 was related to environmental factors, e.g. change in ocean temperature.
FIGURE 19. TRENDS IN CATCH, EFFORT, YIELD 1913–1931.
Increased fleet expansion after 1912, coupled with increased effort and greater vessel efficiency, placed added strain on overall halibut populations within an economical spatial radius of the catching sector. The newly exploited grounds as well as the longer fished southern grounds could not maintain outputs which were reached between 1910 and 1915. This resulted in decreased yields, generally higher halibut prices and smaller average landings per trip per vessel. For example, the average landings of the Seattle schooner fleet decreased from 29,337 pounds per trip in 1915 to 10,465 pounds in 1918.26 Average landings per trip of the steamer fleet decreased from 106,457 pounds to 55,872 pounds over the same period.27 Because of such decreases, Seattle in particular, was not in a position to maintain its dominant place in the fishery.

Although westward expansion promoted decentralization in the spatial structure of the Eastern Pacific halibut industry during the 1913-1931 period, it did not solve the problems of resource depletion and overfishing. Unrestricted entry into the fishery (apart from capital constraints) resulted in increased depletion of stocks and underemployment of men, vessels, and gear within the catching sector. Technological innovations supported by relatively strong prices throughout most of the period resulted in the halibut fishery being characterized by over-expansion.

**Fleet Transition**

The initial period of the fishery was dominated by the company-owned fleets for reasons previously discussed. The New England Fishing Company had made Vancouver its headquarters and was the major company operating steamers. Vessels in the company fleet averaged 125 tons, were approximately 100 feet long, carried 12 dories and a crew of 30-35 men with a
carrying capacity of 200–250,000 pounds. A vessel in the 1915 Seattle-based independent fleet averaged 27.2 tons, carried an average of 4 dories and 10 men, and had an average carrying capacity of 51,685 pounds. The steamer-based ports therefore had great advantage over the smaller ports.

Company-owned fleets had been extremely effective in the initial phase of the fishery. For example, one steamer alone accounted for 1.6 million pounds of halibut (27% of the total catch) in six months fishing during the winter of 1898-99. With increased depletion of stocks, however, the operating costs of the steamer fleet rose sharply. Because of their large size they could not readily engage in longlining operations effectively. This meant that their dories had to be used in the open waters of the Gulf of Alaska, and it proved uneconomical to do so because of more adverse weather conditions than was the case south of Cape Spencer.

Table IV shows the number of steamers in the halibut fishery during the 1913-1931 period. Vertical integration was necessary in the early phase of the fishery in order to assure adequate supplies of halibut for the cold storage sector. The expanded independent fleet now served this role

<table>
<thead>
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<th>Year</th>
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<td>1927</td>
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</table>

Source: IFC Report No. 5
which further contributed to the decline of the company-owned fleet. The temporary increase in the size of the fleet from 13 in 1912 to 18 in 1913 was brought about by expansion of cold storage facilities at Prince Rupert. At that time the Prince Rupert independent fleet consisted of a few small vessels which were not capable of producing the volumes of halibut that the new cold storage facilities were capable of handling. With the completion of the railway, however, the independent fleet at Prince Rupert expanded rapidly and overcame this difficulty. Essentially, the role of Vancouver and Tacoma in the fishery declined with the passing of the company fleets. Neither of these ports had developed independent fleets like those of Seattle and Prince Rupert, and were largely dependent on company vessel landings.

Development of an independent fleet proceeded much slower in British Columbia than in Washington. Table V shows the number of independent vessels operating from the major ports in various years of the 1913-1931 period. The Underwood Tariff Act of 1913 eliminated the one cent per pound import duty on halibut imported into the United States from Canada, but it did not have any immediate impact on vessel construction in British Columbia. The full impact of the Act was not felt until the development of Prince Rupert as a major halibut port in 1915. The size of the Canadian fleet increased from approximately 35 vessels in 1915 to 100 vessels in 1918. During the same period the size of the Prince Rupert fleet increased from 17 to 71 vessels.

Continued extension of the halibut fishery during the 1913-1931 period was accompanied by the rise of independent fleets outside Puget Sound and the Lower Mainland. After the rise of Prince Rupert as a
Table V

Number of Vessels >10 Tons with Home Port at the Major Ports and Total Gear Fished 1912-1931.

<table>
<thead>
<tr>
<th>Year</th>
<th>Seattle</th>
<th>Vancouver</th>
<th>Prince Rupert</th>
<th>Ketchikan</th>
<th>Juneau</th>
<th>Petersburg</th>
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<td>12</td>
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<td>--</td>
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<tr>
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<td>(460000)</td>
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<td>55</td>
<td>44</td>
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</table>

(1) Information not available.

N.B. These six ports accounted for approximately 85% of all vessels in the halibut fleet. The remaining 15% were based at smaller ports throughout the region e.g. Wrangell, Sitka, Seaward.

Source: Pacific Fisherman Yearbook(s).
major landing/processing and marketing port, its fleet outnumbered that of Vancouver. In much the same manner the Alaska-based fleet grew at the expense of the Seattle fleet. With increased expansion of the catching sector many fishermen from Washington established permanent headquarters at such places as Juneau, Sitka, Ketchikan, Petersburg, and Wrangell. The fleets which developed at these ports were smaller in size and number than the main fleet at Seattle. For example, the average net tonnage of the Seattle-based fleet in 1931 was 28 tons compared to 20 tons for the Ketchikan-based fleet.\(^{33}\)

Since the small independent fleets were located near the major producing grounds in northern British Columbia and Alaska waters, their required operational radius was far less than that of the larger vessels based to the south. In this respect they held an advantage over the southern fleet, but this was counterbalanced by the lower prices (approximately two to five cents per pound less) which the Prince Rupert and Alaska-based fleets received for their catches. Therefore, when prices declined substantially, the larger vessels from Vancouver and Seattle were in a better position to deliver their catches to the southern ports. This explains why Vancouver and Seattle increased their landings between 1926 and 1931.

By the end of the 1913-1931 period, the independent fleet had completely replaced the company fleets which developed prior to 1914. Increases in the price of halibut and more favourable market conditions made it more profitable for fishermen and speculative backers\(^{34}\) to invest in increased numbers of vessels thereby contributing to rapid expansion of the independent fleet during the second period. From a small number of
small sailing vessels at the turn of the century, the independent fleet expanded to approximately 500 relatively large powered vessels by 1931.

Although the Canadian fleet increased in number throughout the 1913-1931 period, its share of the total catch decreased from 26.5% in 1915 to 17.4% in 1931. This reflected the faster increase in the size of the American fleet, as well as the retirement of the steamers from the Canadian fleet. Despite this, landings of halibut at British Columbia ports increased from 33.3% of the total catch in 1913 to 41.4% of total landings in 1931. The rise of Prince Rupert made it convenient for vessels in the American fleet to land a greater proportion of its catch at this port. This accounts for the upward shift in British Columbia port landings during the period despite a significant decrease in the percentage of the catch by the Canadian sector of the fleet.

The rise of the independent fleet had important implications for the halibut industry as a whole. Fleet expansion came at a time when yields from most of the fishing grounds were declining. Any increase in the number of vessels resulted in increased amounts of effort being employed. Catch returns were not proportional to the amount of effort expended and consequently fishermen were competing for relatively stable catches year after year. This resulted in overinvestment of capital within the fishery. By 1924 the profits of many vessel owners were not in keeping with the amount of investment, labour, and hazards involved. The amount of effort had increased two and one-half times between 1915 and 1930 but the catch declined by 38% over the same period.

The Halibut Convention of 1923

It is clear from the foregoing that the halibut industry reached a
critical turning point during this period. Either biological and other controls had to be introduced or the industry would suffer the same fate as the Atlantic halibut fishery, that is almost total resource depletion. Recognizing this situation the United States and Canadian governments signed the Halibut Convention on March 2, 1923. This convention was the first international agreement aimed at regulating a seriously depleted deep-sea fishery. Concern was being expressed by those engaged in the industry over depletion of halibut stocks long before signing of the convention, especially by the Fishing Vessel Owners Association of Seattle.

In 1914, the government of British Columbia solicited the services of a biologist (W. F. Thompson) to investigate the life-history of the Pacific halibut. The Report of the British Columbia Department of Fisheries for 1914 stated that "It is beyond question that... some protection must be extended to the species in the near future." In 1916 a Bill was introduced in the United States Congress (Senate Bill 4586) to establish a closed season for halibut and to close known nursery grounds. Enforcement of these provisions, however, was dependent on similar action by Canada because of the international nature of the fishery.

The American-Canadian Fisheries Conference of 1918 led to the signing of a halibut treaty which provided for a closed season for halibut and reciprocal port privileges. The treaty was not ratified, however, because the two parties could not agree on non-conservation matters such as port-use privileges and tariffs. The exclusion of trade and economic factors finally led to the signing of the Halibut Convention in 1923. It is
interesting to note that those directly engaged in the industry, i.e. fishermen and fish dealers, were advocating measures to protect the fishery, but political disagreement at the international level prevented the adoption of the necessary measures.

Arising from the convention the International Fisheries Commission was established in 1923, consisting of four members, two from each country, with the joint expenses incurred by the Commission to be divided equally between the two countries. The Commission was not given the powers to restrict vessel entry into the fishery but to conduct a thorough investigation into the life-history of the Pacific halibut and to make recommendations as to the regulation of the fishery.

As these biological studies would take some time to develop, the Commission immediately established (1924) a closed season from mid-November to mid-February to coincide with the halibut spawning period. This move did not increase yields per skate because of the fact that fishing effort was concentrated in the summer months anyway.

Toward the end of the 1920-30 decade it had become clear that the 1923 Convention required changing and in 1930 it was re-negotiated. This time the Commission was given the power to implement catch quotas by areas to be delimited; to prohibit the departure of vessels for waters where set limits were close to being reached; to fix the size and type of gear used in any area; to make regulations essential for the collecting of statistics; and to close fishing areas frequented by small, immature halibut. As a result of these measures, greater constraints were placed upon the industry in the 1932-1951 phase of the fishery.
References


3. Ibid. pp. 4, 5.

4. Ibid. p. 7.

5. Ibid. p. 7.

6. Ibid. p. 7.

7. Pacific Fisherman Yearbook(s) 1913-1931. passim

8. Bell, F. H. et al. op. cit. p. 31 and Pacific Fisherman Yearbook(s) 1913-1931. passim.


11. Bell, F. H. et al. op. cit. p. 31


21. Ibid. p. 1
25. Ibid. p. 33.
27. Ibid. p. 119
32. Ibid. pp. 121, 121a.
36. Ibid. pp. 4, 5.


Chapter V

Spatial Adjustment, Commission Quota Control, and Extreme Competition 1932-1951.

Stages I and II of the Pacific halibut fishery were characterized by heavy exploitation and depletion of the major halibut grounds as a result of intensive fishing pressure. The industry passed through an unregulated phase in which there were no restrictions on annual catch and entry. The ever-increasing halibut fleet operated in response to the changing productivity of fishing banks throughout the Pacific Northwest. By the end of the second stage (1913-1931) all major banks with the exception of those in the Bering Sea had been exposed to heavy exploitation. The frequent shift to new grounds which was a dominant aspect of the earlier stages of the fishery was not characteristic of the third stage (1932-1951). Rather, the third stage of the halibut fishery was one in which the spatial structure of the industry was confined to previously developed boundaries. The imposition of quota controls (commencing in 1932) by the International Fisheries Commission was to affect the catch from various sectors of the halibut grounds and as a result resource stocks were to improve during the period. Nevertheless, the fleet expanded very rapidly and competition between vessels for a share of the catch became very keen. As a result of such competition the duration of the fishing season was decreased phenomenally since the quotas were taken in far less time. The functional structure of the industry was limited to two components, the longliner and small boat sectors.
Spatial Structure

Between 1888 and 1931 all major halibut banks of the Eastern Pacific with the exception of those in the Bering Sea had come under intensive fishing pressure. No expansion to new grounds occurred during the 1932-1951 period although there was a general shift in the amount of effort to the western grounds initially developed in the previous period. Between 1932 and 1939 relatively low halibut prices led to little variation in the amount of effort expended, but from 1939 onwards upward price movement and a number of other factors increased the number of vessels entering the fishery.

Figure 20 shows the spatial structure of the industry during the 1932-1951 period. It depicts the increased importance of secondary ports in the industry. Because of an increase in halibut stocks on the inshore grounds, the small boat sector of the industry became of some importance once again. For reasons to be examined, there was also less tendency for some vessels in the fleet to land their catches away from home port. Although much of the fishing activity was again centred a considerable distance from the most southern ports, no major halibut port developed west of Cape Spencer. During the period a larger number of vessels were operating from all ports within the industry, but the spatial range of the catching sector was greatest for those vessels based at the railhead ports.

Similarly, Figure 21 shows that Southeast Alaska locations increased their share of the catch over that of the 1913-1931 period. Prince Rupert landings decreased somewhat as more of the American vessels elected
Legend

- ▲ RAILHEAD LOCATION PORTS
- ● SECONDARY PORTS
- ● FISHING STATIONS (MINOR PORTS)
- ■ COLD STORAGE FACILITIES
- —— LIMIT OF FISHING OPERATIONS
- → RANGE OF FISHING VESSELS
  BASED AT EACH PORT TYPE
- ——— VESSELS ELECT TO LAND PART OF YEARLY CATCH
  AWAY FROM HOME PORT

to land a greater part of their catch on Puget Sound. Expansion of the independent fleets at Southeast Alaska locations resulted in greatly increased landings at ports in that area. Landings at ports in West Central Alaska increased slightly over the previous period. The increase in landings at other minor ports in British Columbia and, to a lesser extent in Washington was the result of greater catches during the period by the small boat sector of the industry.

In the 1913-1931 period, grounds west of Cape Spencer produced approximately 41% of all Eastern Pacific halibut landings. During the 1932-1951 period, landings from these western grounds accounted for 49% of total average annual landings. Figure 22 shows the area over which fishing was carried out in the third period and the breakdown of catches from various sectors of the halibut grounds. In general, the grounds north by Cape Scott were exposed to the greatest amount of fishing pressure and were the source of the heaviest landings. Grounds south of Cape Scott support less prolific stocks and in the early years of the period quota controls were designed to take pressure off these heavily depleted grounds.

Although the radius of the catching sector was not extended to new fishing grounds, changes did occur in the pattern of landings by region. This gave rise to a more even distribution of landings in Washington, British Columbia, and Alaska. Washington landings remained unchanged from the previous period at 31% of a slightly increased catch. British Columbia landings decreased from 53% in the 1913-1931 period to 40% in the 1932-1951 period. Alaska experienced a significant increase in average annual landings from 17% in the previous period to 29% in
FIGURE 22. AVERAGE ANNUAL CATCH FROM VARIOUS GROUNDS 1932–1951.
the 1932-1951 period. In addition to a general westward shift in volume of catch there was an accompanying shift in regional landings as well (Figure 23).

The significant changes which occurred throughout the period were: the decline in Washington landings after 1939; the relative stability of British Columbia landings after the same date; and the increase in Alaska landings but most notably after 1939. The increased westward trend in landings was in large measure attributable to increased catches from the western grounds and the tendency for vessels to land their catch at ports close to the grounds. This was especially the case in the final years of the period when the fishing season duration was reduced sharply. In an attempt to increase their share of the catch, individual vessels tried to make as many trips as possible. To do this, they elected to land all, but their final trip at ports close to the grounds they were fishing.

Halibut prices fell sharply during the depression and were slow to recover. For example, the average price per pound of halibut landed in British Columbia fell from 13 cents per pound in 1926 to 4 cents per pound in 1932. To combat the low prices which prevailed, the fishermen instituted a between-trip layover program and set vessel quotas. To avoid heavy landings of halibut on any given day, half the fleet stayed in port while the remaining half engaged in fishing operations. This system worked quite effectively but increased demand for halibut and higher prices after 1939 resulted in increased numbers of non-regular halibut vessels entering the fishery. For maritime surveillance purposes the lay-over program was terminated after the 1942
FIGURE 23. AVERAGE ANNUAL LANDINGS BY PORT AREA 1932–1951.
fishing season and was not re-instituted after the war ended because the influx of vessels mitigated against this. During the years in which the program was in effect, vessels landed a greater share of their catch at home port.

Figure 24 shows the increase in halibut prices after 1939 (based on prices at Seattle). This factor, together with the termination of the between-trip layover program, weakened Washington's position in the halibut industry in terms of primary landings. Other factors affecting the position of Seattle and other ports in the industry during the 1943-1945 period will be discussed later in the chapter.

As was the case in the 1913-1931 period, halibut landings were dominated by three major areas: Puget Sound, northern British Columbia, and Southeast Alaska. Because of operating constraints placed upon the catching sector during the period, minor shifts did occur in landings throughout the region as a whole. The position of Puget Sound remained unchanged over the previous period at 31% of average annual landings, while landings at northern British Columbia decreased from 38% of average annual landings to 31%, and those in Southeast Alaska increased from 19% to 25\%^7. Table VI shows how the landings were distributed throughout the Pacific Northwest for all three periods.

<table>
<thead>
<tr>
<th>Table VI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average Annual Halibut Landings by Port Area 1888-1912, 1913-1931, 1932-1951. ('000 lbs.)</td>
</tr>
<tr>
<td>Period</td>
</tr>
<tr>
<td>----------------------</td>
</tr>
<tr>
<td>1888-1912</td>
</tr>
<tr>
<td>1913-1931</td>
</tr>
<tr>
<td>1932-1951</td>
</tr>
</tbody>
</table>

The emergence of major halibut ports in Southeast Alaska is shown
FIGURE 24. TRENDS IN LANDINGS BY REGION AND AVERAGE PRICE PER POUND (BASED ON SEATTLE PRICES) 1932–1951.

CATCH
(MILLIONS OF POUNDS)

YEARLY CATCH
LANDED IN WASHINGTON
LANDED IN BRITISH COLUMBIA
LANDED IN ALASKA
AVERAGE PRICE
in Table VII. These ports, like the small ports in British Columbia, benefited from the increase in halibut stocks during the period as the result of quota regulation of the fishery but Vancouver and Ketchikan did not improve their relative positions. Nevertheless, Ketchikan, because of its proximity to the major halibut grounds captured a larger share of landings than Vancouver.

Cold storage facilities established at western locations such as Seward and Seldovia during the second period were only able to attract landings mainly from vessels based at these ports during the 1932-1951 period. Prices paid for halibut at the western ports were considerably lower than those paid at more southern locations. Fish landed outside the major railhead ports had to absorb transportation costs incurred in shipment to the railheads for final market delivery.

The spatial characteristics of the halibut fishery in the 1932-1951 period were therefore a function of increased westward shift in catches, the sharp increase in halibut prices, the imposition of halibut quota controls, a sharp increase in the number of vessels entering the fishery, and the discontinuation of the voluntary between-trip layover program. Between 1943 and 1945 the Office of Price Administration of the United States imposed price ranges at the various ports and this was to have a bearing on the distribution of halibut landings during these years. By the end of the 1932-1951 period, the relative proximity of northern British Columbia and Southeast Alaska ports to the major producing grounds, acted upon by the above factors, assured them of a large proportion of the halibut catch.
### Table VII

**Halibut Landings By Port 1932-1951 ('000 lbs.)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Seattle</th>
<th>Vancouver</th>
<th>Prince Rupert</th>
<th>Ketchikan</th>
<th>Wrangell</th>
<th>Petersburg</th>
<th>Sitka</th>
<th>Pelican</th>
<th>Juneau</th>
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</thead>
<tbody>
<tr>
<td>1932</td>
<td>21791</td>
<td>1188</td>
<td>14860</td>
<td>3157</td>
<td>150</td>
<td>482</td>
<td>53</td>
<td>--</td>
<td>673</td>
</tr>
<tr>
<td>1933</td>
<td>21761</td>
<td>1343</td>
<td>14406</td>
<td>2877</td>
<td>325</td>
<td>1089</td>
<td>845</td>
<td>--</td>
<td>1621</td>
</tr>
<tr>
<td>1934</td>
<td>20205</td>
<td>1513</td>
<td>16537</td>
<td>3155</td>
<td>284</td>
<td>1002</td>
<td>1172</td>
<td>--</td>
<td>1463</td>
</tr>
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<td>1935</td>
<td>21691</td>
<td>2246</td>
<td>14563</td>
<td>3752</td>
<td>112</td>
<td>474</td>
<td>667</td>
<td>--</td>
<td>1341</td>
</tr>
<tr>
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<td>22572</td>
<td>2054</td>
<td>14318</td>
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<td>1979</td>
<td>945</td>
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<td>1541</td>
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<tr>
<td>1937</td>
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<td>2333</td>
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<td>3642</td>
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<td>1352</td>
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<td>--</td>
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<td>15943</td>
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<td>906</td>
<td>--</td>
<td>2039</td>
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<td>19223</td>
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<td>--</td>
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<td>18831</td>
<td>1999</td>
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<tr>
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<td>2023</td>
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<td>2363</td>
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<td>7503</td>
<td>643</td>
<td>2828</td>
<td>2634</td>
<td>2200</td>
<td>3232</td>
</tr>
<tr>
<td>1948</td>
<td>9434</td>
<td>2641</td>
<td>16144</td>
<td>7600</td>
<td>716</td>
<td>2548</td>
<td>2990</td>
<td>2362</td>
<td>2797</td>
</tr>
<tr>
<td>1949</td>
<td>10006</td>
<td>2129</td>
<td>17950</td>
<td>7628</td>
<td>499</td>
<td>2675</td>
<td>2008</td>
<td>2102</td>
<td>2473</td>
</tr>
<tr>
<td>1950</td>
<td>7473</td>
<td>1096</td>
<td>18921</td>
<td>6992</td>
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<td>3823</td>
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<tr>
<td>1951</td>
<td>9648</td>
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<td>5170</td>
<td>496</td>
<td>2869</td>
<td>1985</td>
<td>2294</td>
<td>2386</td>
</tr>
</tbody>
</table>

**Functional Structure**

Figure 25 shows the functional structure of the halibut industry during the 1932-1951 period. By 1930 the company-owned steamer fleet had been almost completely retired from the industry\(^9\) and the dory vessel fleet was only accounting for a very small percentage of the total catch.\(^{10}\) Virtually the entire fleet had switched to the more efficient longlining method of fishing. As a result the functional structure of the industry in the third period consisted of only two components -- the longliner and the small boat sectors. This compares with three components in the initial phase of the fishery and four components in the 1913-1931 period.

The phasing out of company-owned vessels eliminated vertical integration in the industry at the company level. As a result the cold storage sector of the ports at which the steamers were based no longer maintained 'captive' fleets. As previously stated, the steamers delivered their catches to the companies which operated them. The base ports were therefore assured of halibut landings for as long as the steamers remained in the industry. This was not the case in the 1932-1951 period. The entire fleet now consisted of independently-owned vessels which landed catches at ports of their choice. Nevertheless, the smaller vessels in the fleet were restricted to the ports from which they operated because of their limited range. The mobility and non-captive ownership of vessels also allowed for freedom of the market since ports had to compete for halibut landings.\(^{11}\)

Prohibition of dory fishing was a move taken by the IFC to meet the changing needs of halibut fishery management. Because of relatively
1. STRUCTURE OF THE INDEPENDENT LONGLINER FLEET

2. STRUCTURE OF THE SMALL BOAT FLEET

light gear (e.g. smaller hooks) used in dory fishing it was found that this type of operation was catching a higher proportion of small-sized halibut than the longliner operation. Dory fishing was therefore prohibited on grounds south of Cape Spencer in 1935, and by the time the prohibition was extended to all convention waters in 1944 little fishing was being carried out by the dory method anyway. Vessels in the small boat sector of the industry employed gear similar to that of the longliner fleet and they continued to function within the industry. Trolling gear also accounted for largely incidental catches of halibut. In 1938 the Commission prohibited any use of bottom set nets because elsewhere it was shown that this was not a very selective type of gear.

The marketing of halibut by the catching and processing sectors changed little over the previous period. The vessels in the longliner fleet continued to land catches almost entirely at the major ports where higher prices prevailed. The small boat sector of the industry continued to land catches at fish buying stations or landing points outside the major port areas. Due to the decreased duration of the fishing season towards the end of the period a greater percentage of the catch was frozen and less of the total catch was delivered to market in a fresh form. The total halibut catch could not be absorbed by the retail market in a fresh form over a relatively short fishing period. For example, in 1932, 31% of the halibut catch was frozen compared with 70% of the catch in 1951.

**Commission Quota Control Implications**

Under Halibut Convention regulations of 1930 and 1937 the Commission was given broader regulatory powers. The quota system was intro-
duced during the 1932 fishing season, with set opening dates for the fishery. The fishing season terminated as soon as quotas were reached. Consequently, competition for the annual quotas became so intense that the length of the fishing season was reduced from 249 days in 1932 to 28 days in 1951 on grounds south of Cape Spencer. On grounds west of Cape Spencer the fishery was somewhat longer—from approximately 288 days in 1932 to 56 days in 1951. Fewer vessels fished on the latter grounds, therefore it took longer for the quotas to be reached in that area.

Since no restrictions were placed on entry into the halibut fishery or the amount of gear that could be fished, such increased competition for annual quotas was distributed over a greater number of vessels. With an increase in stocks because of halibut control measures, more and more vessels found it economically worthwhile to engage in the halibut fishery. A large number of new entrants into the fishery were vessels that also engaged in other sectors of the fishing industry—mainly the salmon fishery. As a result of unrestricted entry and the economic attractions due to improved halibut stocks, the number of vessels engaged in the halibut fishery increased from 407 in 1932 to 820 in 1951.

The greatest increase in the number of vessels was felt on the grounds off northern British Columbia and Southeast Alaska. Since they were not as large and, hence, not as mobile as the vessels which operated on the more distant banks, they found it convenient and advantageous to land catches at such ports as Prince Rupert, Ketchikan, Pelican, Sitka, and Petersburg. This contributed to the significant expansion of these and other ports in the same general area during the 1932-1951 period.
Commission quota controls were designed to improve halibut stocks on all heavily depleted grounds of the Eastern Pacific. The long-run expected outcome of such controls, however, was that not only would halibut stocks replenish themselves but economic efficiency would improve within the industry as well. With no limitations on the number of vessels which could enter the fishery during any given year, vessels from other sectors of the fishing industry could readily engage in the halibut fishery. This meant that by the end of the 1932-1951 period any economic returns from the improved stocks had to be shared by twice the number of vessels.

Although there was a two-fold increase in the number of vessels over the 1932-1951 period, there was also a considerable increase in halibut stocks on all grounds. The catch increased from 44.4 million pounds in 1932 to 56.3 million pounds in 1951 with slightly higher catches for a number of years during the period. Figure 26 shows the trends in catch, amount of gear fished, and yields for Area 2 and Area 3 for the 1932-1951 period.

Average yield per skate of gear is a function of stock size, fishing intensity, and environmental factors such as wind and tide conditions. The number of skates of gear employed throughout the period declined slightly on the western grounds and quite considerably on the southern grounds. The decreasing length of the fishing season reduced the fishing time and hence the number of skates of gear fished. Since the catch was taken in far less time by a smaller amount of effort, it meant that halibut were more abundant over all sections of the fishing grounds. From Figure 26 it can be seen that there was considerable improvement in stocks
on the southern grounds which had been severely depleted before quota regulation.

The quota system placed time constraints on the catching and processing sectors of the industry. In attempting to restore stocks, the Commission was aiming for a greater supply of halibut in the long run. Without restrictions on freedom of entry into the fishery, however, there were some short run effects. The decrease in the length of the fishing season resulted in inventories of halibut having to be held in cold storage for a longer period of time. In years of heavy production and relatively low demand inventories remained high. This meant lower prices being paid to fishermen at dockside for halibut or higher prices being charged the consumer to cover additional freezer costs. Generally it was the latter because the eastern market was also open to large volumes of other whitefish with which halibut competed. Once halibut was priced too high, consumers substituted such lower priced species as haddock, cod and sole.

A second result of improved halibut stocks was reduced fishing costs. Since yields were greater per unit of effort, the amount of gear fished and the number of hours spent fishing were reduced considerably. There occurred a reduction of approximately 29% in the amount of gear employed in Area 2 between 1932 and 1951. In Area 3 the declined amounted to approximately 11% over the same period. The smaller decline in Area 3 can be attributed to a smaller number of vessels fishing these waters and a longer fishing season. Yields on the western grounds were much higher than those on the southern grounds. Because of this less effort was required in order to attain the set quotas.
The overall objective of the Commission was to restore halibut stocks to near maximum sustainable yield levels. This was achieved during the 1932-1951 period. By effectively managing each area of fishing ground, it provided for stock restoration throughout the Eastern Pacific halibut grounds.

**Shortened Fishing Season Implications**

Figure 27 shows the length of the fishing season for the 1932-1951 period and the sharp decline that occurred on grounds south and west of Cape Spencer. The annual quotas which were imposed by the Commission were not designed to decrease the length of the fishing season. The setting of annual quotas was the most effective means to replenish decreased halibut stocks. The possibility of larger economic gains led to the decrease in the duration of the fishing season, because of the increase in the number of vessels. This would probably not have occurred had the halibut fishery been left unregulated. With unrestricted entry into the fishery, the length of the fishing season declined sharply.

There was a time lag of approximately seven years between the imposition of quotas, commencing in 1932, and the increase in halibut landings at ports in northern British Columbia and Southeast Alaska. Because of the influx of vessels into the halibut fishery, the time/distance factor between fishing grounds and landing ports became critical. Each vessel in the halibut fleet would attempt to maximize output in the shortest time possible, thereby preferring to land catches at those ports close to the fishing grounds.

Between 1932 and 1941 the halibut fleet's voluntarily instituted
FIGURE 27. LENGTH OF THE FISHING SEASON IN AREA 2 AND AREA 3 1932–1951.

N.B. IN 1935 FLEET TIED-UP VOLUNTARILY UNTIL APRIL 1.
IN 1943 FLEET TIED-UP UNTIL MAY 20 TO PROTEST OPA PRICES
IN 1947 SEATTLE FLEET TIED-UP UNTIL JULY 1 DUE TO SHARE DISPUTE
between-trip layover program and vessel quotas tended to restrict the number of vessels which entered the fishery. The increase in halibut prices after 1939, in particular, attracted a larger number of vessels into the fishery and greatly increased competition for the annual quotas. As a result of such competition, and the attempt to minimize the time/distance factor to and from fishing grounds, landings decreased considerably at the southern ports of Seattle and Vancouver, but increased in such northern ports as Prince Rupert, Ketchikan, Juneau, Petersburg, Sitka, and Pelican.

Illustrative of the shift in vessel movement over the 1932-1951 period is the case of Seattle. In 1932, when the length of the fishing season was at its longest for the period, halibut vessels made 1134 landings averaging 19,216 pounds per trip at Seattle. By 1951, the number of landings at this port had dropped to 485, but the average landings of each vessel had increased slightly to 19,879 pounds. As a result of the decreased duration of the fishing season, each vessel would tend to maximize the amount of time spent in actual fishing operations. Therefore, the fleet found it just as profitable to land its catch at the northern ports, where slightly lower prices prevailed, than deliver the catch to southern ports and lose valuable fishing time.

In essence, the shortened fishing season placed limitations on vessel movement within the halibut industry because it limited the number of trips any one vessel could make. This meant that fishermen could not gamble on exploratory trips and were forced to restrict movement on the fishing grounds. Therefore, most of the fleet's effort was confined
to the most favourably located grounds where the chances of securing the largest catches in a relatively short fishing period were highest. Essentially the fleet tended to minimize the time/distance factor between producing grounds and landing ports.

Table VIII shows that the halibut fishery on grounds north of Cape Spencer was carried out by a considerably smaller fleet than on the grounds south of Cape Spencer. The vessels which fished the western grounds were larger and more highly mobile than most of the vessels which fished the southern grounds. Therefore they were capable of carrying larger volumes of halibut over greater distances. Because of less competition on the western grounds the fishing season was longer. This enabled the larger western fishing vessels to deliver their catches to the ports of Seattle and Vancouver, since prices at ports in west central Alaska were considerably lower. In addition, practically all vessels operating on the western grounds were American-owned and this resulted in considerably greater landings at Seattle than at Vancouver. A large number of American vessels, however, did elect to deliver catches to Prince Rupert.

The extent to which prices paid an important role in allocation of the halibut catch is borne out by the situation which existed in 1943. In July of 1943, the U. S. Office of Price Administration established price parity between Seattle and Prince Rupert for fresh halibut. This move was made to reduce the sharp increases in halibut prices during the war. This resulted in landings ceasing entirely at Seattle and increasing at Prince Rupert for the remainder of the season. In 1944 due to industry
### Table VIII

Vessel, Manpower, and Catch Trends 1943-1951

<table>
<thead>
<tr>
<th>Year</th>
<th>TOTAL</th>
<th>CANADIAN</th>
<th>AMERICAN</th>
<th>Total Catch</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vessels</td>
<td>Men</td>
<td>Vessels</td>
<td>Men</td>
</tr>
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<tr>
<td>1951</td>
<td>820</td>
<td>4077</td>
<td>270</td>
<td>1346</td>
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</tbody>
</table>

Source: International Pacific Halibut Commission Reports. Pacific Fisherman Yearbook(s).
protest, the OPA established a price differential between Seattle and Prince Rupert, and reduced price disparity between Alaska and Prince Rupert.\textsuperscript{23} This, in turn led to increases in Alaska landings and increased landings at Seattle. Company allocation of landings during 1944-1945 had a minor effect on port landings because the amount each company was allotted was based on a five year average prior to 1944. Government intervention to regulate prices terminated late in 1945 after the war had ended.

The westward shifts in output from fishing grounds and of landings resulted in the cold storage sector of the industry becoming more important in the northern areas. Although cold storage facilities had been located at such ports in the 1913-1931 period, most landings were made at Ketchikan and Prince Rupert. With increased activity on the northern and western grounds, more favourable prices, and the shortened fishing season, excess-capacity no longer existed in the cold storage sector of the northern ports. Plant capacities at the smaller ports, however, were much smaller than those at Prince Rupert. The smaller cold storage plants scattered throughout Alaska were mainly satellite operations of the large Seattle based companies, and were established in conjunction with westward shifts in the catching sector. Most of the halibut was then shipped to Seattle by packer/freighter for distribution in the North American market. Some quantities of fresh halibut were marketed through Prince Rupert, but it was cheaper to ship halibut direct from Alaska points to Seattle than to ship via Prince Rupert.\textsuperscript{24} This was because regular shipping lines operated between Alaska and Seattle.
Unrestricted Entry

Table IX shows the sharp increase in the number of vessels and men engaged in the Pacific halibut fishery over the 1932-1951 period. Such an increase was inversely proportional to the length of the halibut fishing season during the same period. Although some new halibut vessels were constructed, the greatest increase in the size of the fleet resulted from non-regular halibut boat movement into the fishery. This movement was encouraged by the improvement in halibut stocks, the low capital costs incurred in entering the fishery, an improvement in halibut prices, and the decreasing length of the fishing season for halibut.

The halibut catch increased from 43.6 million pounds in 1932 to 56.0 million pounds in 1951. The number of vessels engaged in the halibut fishery increased from 407 to 820 over the same period. A 22% increase in catch was taken by a fleet which increased its size by 100%. The amount of effort expended decreased, however. The fact that a larger catch was taken in far less time reflected greater halibut abundance on the grounds. The total amount of effort decreased 22%, from 709.8 thousand skates in 1932 to 556.8 thousand skates in 1951, and the yield per skate increased from 65.5 to 102.0 pounds.

The Commission did not restrict entry into the halibut fishery, but from time to time took measures to prevent foreign interests (e.g. the British) from engaging in the exploitation of the Pacific halibut resource. The deciding factor which determined whether or not any given number of vessels would enter the fishery was related primarily to market conditions. If prices were high, vessels from other sectors of the fishing industry found it economically worthwhile to engage in the halibut fishery. When
Table IX

Number of Vessels and Men in the Pacific Halibut Fleet 1932-1951

<table>
<thead>
<tr>
<th>Year</th>
<th>Vessels and Boats</th>
<th>Men</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>U.S.</td>
<td>Canadian</td>
</tr>
<tr>
<td>1932</td>
<td>322</td>
<td>85</td>
</tr>
<tr>
<td>1933</td>
<td>301</td>
<td>83</td>
</tr>
<tr>
<td>1934</td>
<td>323</td>
<td>115</td>
</tr>
<tr>
<td>1935</td>
<td>303</td>
<td>129</td>
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<td>1936</td>
<td>335</td>
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<tr>
<td>1937</td>
<td>373</td>
<td>158</td>
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<tr>
<td>1938</td>
<td>345</td>
<td>164</td>
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<tr>
<td>1939</td>
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<td>180</td>
</tr>
<tr>
<td>1940</td>
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<td>172</td>
</tr>
<tr>
<td>1941</td>
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<td>179</td>
</tr>
<tr>
<td>1942</td>
<td>342</td>
<td>155</td>
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<tr>
<td>1943</td>
<td>354</td>
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<tr>
<td>1944</td>
<td>362</td>
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<td>1945</td>
<td>413</td>
<td>178</td>
</tr>
<tr>
<td>1946</td>
<td>489</td>
<td>192</td>
</tr>
<tr>
<td>1947</td>
<td>469</td>
<td>220</td>
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<td>254</td>
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<td>1949</td>
<td>523</td>
<td>230</td>
</tr>
<tr>
<td>1950</td>
<td>576</td>
<td>240</td>
</tr>
<tr>
<td>1951</td>
<td>542</td>
<td>278</td>
</tr>
</tbody>
</table>

Source: Pacific Fisherman Yearbook(s) passim.
prices fell, as they did in the early stages of the fishery, vessels would drop out and return again when prices reached favourable levels. Therefore, the vessels engaged in the fishery on a regular basis suffered from the influx of vessels from other sectors of the industry.

The problem of managing a common property resource such as halibut is characteristic of all major fisheries. Since no one individual has control over the resource, exploitation is open to those who wish to enter the fishery. This will continue until the bionomic yield is reached, or when average costs equal average revenues. A statement made by a fishing company manager engaged in the Pacific fishing industry sums up the behavior of fishermen and firms quite well:

"The bright sun of prosperity shines for a season or two upon regular stand-bys in the business and it looks very attractive and inviting to some chaps with an old vessel or a little spare money. So they jump in and for a time cut a brilliant dash in the business. So bright are they that the sun of prosperity is all in eclipse and everyone in the trade walks in shadow. When they get tired of this, or broke, they drop out, and those who are left pick up the scattered ends of the trade, struggle out in the light again and by and by there is some more prosperity, and then a new crop of hopeful investors appears and so on, and on."26

Between 1932 and 1939, low halibut prices combined with the voluntary layover program kept down the number of vessels which entered the fishery.
From 1940 onwards, however, with the exception of 1942, when a number of vessels were assigned wartime duties, there was a steady increase in the number of vessels engaged in the halibut fishery. This, in part, was related to strong halibut prices throughout the remainder of the period. The largest increase occurred in the Canadian sector of the fleet which increased in size from 85 to 270 vessels, an increase of 329%. The American fleet increased 68% from 322 to 542 vessels over the period.

Virtually all vessels which entered the halibut fishery on a part-time basis belonged to the large salmon fleet of the Pacific Northwest. With the continued decrease in the duration of the halibut fishing season, the halibut and salmon fisheries no longer overlapped to any significant extent. Since the most productive part of the halibut season occurred before the salmon fishery reached its peak, a greater number of seiners and trollers found it convenient to engage in the halibut fishery part-time. Because of cheaper conversion costs in switching from the salmon fishery (e.g. seining) to the halibut fishery (longlining), the regular halibut boats did not have the same degree of freedom of entry into the salmon fishery. With decreased returns from the shortened halibut fishery, however, a greater number of regular halibut boats were forced to engage in other sectors of the fishing industry. This in turn led to an increase in the number of multi-purpose vessels engaged in the Eastern Pacific fishing industry.

The replenished halibut stocks on the southern grounds in particular made it possible for small boats (less than 5-10 tons) to play a more important role in the halibut fishery throughout the 1932-1951 period. In the early phase of the fishery, the day-to-day operating sector
decreased in importance because of depletion of stocks on fishing grounds close to shore. Once the condition of halibut stocks improved, a larger number of the smaller vessels entered the fishery during the third period. This sector of the fishery was confined mainly to the west coast of British Columbia and Alaska. In the main the limited range and capacity of the small boat fishery vessels resulted in them not being able to use ports such as Prince Rupert for headquarters. Therefore, they relied on the packer system to deliver catches from the more isolated areas. The increased role of small boats during the period accounts for the increased landings of halibut on Vancouver Island and the north central coast of British Columbia.

In the early years of the Pacific halibut fishery, high fishing costs combined with low halibut prices played a major role in determining the number of vessels which entered the halibut fishery. This was especially the case after resource depletion on the near shore grounds led to a truly deep sea fishery requiring greater capital outlay requirements for larger vessels. Because of investment from outside the industry, as well as within, a larger number of vessels entered the halibut fishery in the 1913-1931 period. By the end of the 1932-1951 period, the fishing industry infrastructure of the Pacific Northwest had developed to the stage whereby diversification of effort was possible on a much larger scale. This resulted in free movement of vessels from the industry in general, to the halibut fishery in particular, and led to a much larger-sized halibut fleet.
References


2. Ibid. p. 2.

3. Ibid. p.p. 4,5.

4. Ibid. pp. 4,5.


13. Ibid. p. 5.


15. Ibid. p. 193

17. Ibid. p. 223.

18. Ibid. p. 225.


Chapter VI

Spatial Encompassment, Fleet Decline, and Sustained Yields 1952-1972

The previous period was characterized by a highly competitive fishery during which unrestricted entry increased the underemployment of vessels, men and gear. Although annual quotas prevailed throughout the period, the operation of the halibut fleet centred around extreme competition for a share of those quotas. This was to continue until the end of the 1955 fishing season when the fleet agreed again upon a voluntary layover between fishing trips. This move resulted in a decrease in the size of the halibut fleet, a greater interest in multi-purpose vessels, and a longer fishing season. In essence, this was conducive to a more rationally organized and conducted halibut fishery. The 1952-1972 period saw the extension of the fishery into the Bering Sea from which only isolated catches had been taken during previous years. Such extension coupled with less competition within the fleet, expansion within the cold storage sector, and generally higher prices resulted in greatly increased halibut landings at far western Alaskan ports and striking declines at some of the more southern and longer established halibut centres. Regulatory and conservation programs of the International Pacific Halibut Commission (IPHC) led to record high landings during the period. The commencement of Russian and Japanese fishing operations in the Bering Sea in the late fifties and early sixties placed added strain on halibut stocks in far western waters. In part, this led to all time low quotas and catches during the final years of the 1952-1972 period and a phenomenal increase in halibut prices.
Spatial Structure

Figure 28 shows the general spatial structure of the halibut industry during the 1952-1972 period. The fishery expanded to new grounds resulting in an increase in the spatial range of the catching sector over the previous period. There was less tendency for some vessels to land part of their catch at the northern railhead port of Prince Rupert. The rise of important secondary ports in far western Alaska resulted in increased landings of halibut being diverted to these locations. Expansion of halibut facilities at Bellingham, just north of Seattle, led to that port developing into a major halibut centre. The decrease in the number of vessels operating in the fleet reduced overall movement within the industry. As in the spatial structure of the previous period, the small boat fishery continued to be an integral component of the industry.

Figure 29 shows that there was a considerable difference between the pattern of landings by port in this most recent period from that which existed in the 1932-1951 period. Landings at Seattle declined sharply while those at Prince Rupert remained relatively stable. Vancouver and Ketchikan increased their landings, and there was little change in landings at the secondary ports near the southern grounds. During the period, however, a number of important halibut ports developed within the industry. Vessels elected to land their catch at a greater degree of decentralization than was the case in either of the earlier periods. These new ports had not developed large independent fleets. This meant that they were largely dependent on vessels from other ports for the halibut landings they received.

Legend

▲ RAILHEAD LOCATION PORTS
• SECONDARY PORTS
○ FISHING STATIONS (MINOR PORTS)
■ COLD STORAGE FACILITIES
→ RANGE OF FISHING VESSELS
BASED AT EACH PORT TYPE
--- VESSELS ELECT TO LAND PART OF YEARLY CATCH
AWAY FROM HOME PORT
SIZE OF THE SQUARE PROPORTIONAL TO AVERAGE ANNUAL LANDINGS FOR THE PERIOD.
ONE QUARTER INCH SQUARE EQUALS 8 MILLION POUNDS

WEST CENTRAL ALASKA PORTS (EXC'L KODIAK)

KODIAK

SOUTHEAST ALASKA PORTS (EXC'L KETCHIKAN)

KETCHIKAN

PRINCE RUPERT

SEATTLE BELLINGHAM VANCOUVER

Average annual halibut landings during the 1952-1972 period approximated 62 million pounds compared to 52.4 million pounds in the previous period. The increase resulted from spatial extension of the fishery to new grounds and increased catches from the previously exploited grounds. The tendency for vessels to land part of their catch at ports relatively close to the major halibut grounds south of Cape Spencer increased slightly, whereas average annual landings from grounds west of Cape Spencer increased from 24.8 to 35.8 million pounds. This represented an increase from 49% to 57% of total average annual landings over the two periods. Most of the increase on the western grounds was associated with the development of the Bering Sea halibut banks. Landings in this region increased from 265 thousand pounds in 1952 to 8.1 million pounds in 1963.

Apart from expansion of the halibut fishery to the Bering Sea, there was little spatial variation in the operation of the catching sector over the various halibut grounds throughout the 1952-1972 period. Significant changes, however, occurred in the landing/processing sector of the industry. The ports of Bellingham, in Washington, and Seward, Kodiak, and Sand Point in west central Alaska developed into major halibut centres. Expansion at Bellingham was related to the initiative of buyers at that port and the construction of a large cold storage plant. The increase in landings at far western locations was indirectly related to increased landings from the extreme western grounds. Developments at these ports will be examined more closely later in this chapter.

The most significant changes in the pattern of halibut landings were associated with the decline of Seattle's role in the primary landing phase
of the halibut industry, and the emergence of Kodiak as the second leading halibut landing port of the Eastern Pacific. Halibut landings at Seattle decreased from 18% of the total catch in 1952 to 4% in 1971. Kodiak's share went from virtually no landings in 1952 to 20% of the total catch in 1971. Landings at Prince Rupert were sufficient for the port to maintain its position as "the halibut capital of the world." Mainly on the basis of an increase in the Canadian percentage of the catch, Vancouver landings increased considerably during the period.

Figure 30 shows the extent of fishing over the Eastern Pacific halibut grounds, and catches from various sectors of the grounds during the 1952-1972 period. With the extension of fishing operations into the Bering Sea, all fishing banks (halibut) of the Eastern Pacific had come under varying degrees of pressure. As a result, fishing was being carried out approximately 2500 miles from the most southerly ports. The southern ports of Seattle, Bellingham, and Vancouver, in particular only accounted for a relatively small proportion of halibut taken on the most westerly banks in the Bering Sea area. With decreased competition for annual quotas, extension of cold storage facilities at western points, a reduction in price disparity of halibut prices at ports throughout the entire region, and increased duration of the fishing season, there occurred a more westerly shift in halibut landings during the period (Figure 31).

During the late nineteen fifties and early nineteen sixties, Commission quota controls were designed to test maximum sustainable yields of most banks. This accounts for the record high catches which were attained during the period. This was especially applicable to the most productive grounds from northern British Columbia waters
westward. The strong reversal in landing practices at far western locations, which accompanied the westward shift in catch, was much different than those of previous periods.

Between 1952 and 1971, Washington's percentage of the total catch decreased considerably from 21 to 10 per cent; British Columbia landings decreased from 42 to 38 per cent; while landings in Alaska increased from 35 to 51 per cent of the total yearly catch. Figure 32 shows the yearly catch for the entire region during the 1952-1972 period, and yearly landings of halibut in Washington, British Columbia, and Alaska. In 1971 the Canadian fleet accounted for 54.6% of the entire Pacific halibut catch. The increased tendency during the period for Canadian vessels to land greater quantities of halibut at Washington and Alaska ports explains the discrepancy between the Canadian catch and landings at British Columbia ports. With increased landings by American vessels in Alaska as well, Prince Rupert, in particular lost ground to Alaskan ports. Landings by American vessels at Canadian ports decreased from 3.0 million pounds in 1952 to 1.5 million pounds in 1971. Canadian landings at American ports increased from 974 thousand pounds to 9.2 million pounds over the same period.

In addition to increased Canadian landings at Alaskan ports during the 1952-1972 period, landings by Canadian vessels at Washington ports increased as well. Most of the landings at the latter locations were made by Vancouver-based vessels that took advantage of higher halibut prices and the greater par value of the American dollar. From 1961 onwards such vessels benefited from the opening of a large cold storage plant at Bellingham, Washington, a short distance south of Vancouver. Despite
FIGURE 32. TREND IN LANDINGS BY REGION 1952–1972.

CATCH (MILLIONS OF POUNDS)

YEARLY CATCH
LANDED IN WASHINGTON
LANDED IN BRITISH COLUMBIA
LANDED IN ALASKA.
increased Canadian landings at Washington ports, in addition to landings by the Puget Sound fleet, Washington landings reached an all time low.

Table X shows the trends in halibut landings at each of the four periods of development. Alaska's increased percentage of the total catch correlates strongly with greater catches from grounds west of Cape Spencer at each stage of development. This partially explains the rise of such halibut centres as Kodiak, Sand Point, and Seward in west central Alaska. Table XI shows the general trends in halibut landings at each of the five major port areas throughout the four periods of development. Again, the increased role of west central Alaska in halibut landings was related to exploitation of halibut grounds in that area.

Figure 32 shows that a more even distribution of landings by sub-region was attained during the 1952-1972 period. With the introduction of the seven-day layover program in 1956, there was an increased tendency for vessels to land part of their catch at home ports. This resulted in landings being more nearly proportional to the number of vessels operating out of the various ports in each sub-region. A decline in the number of vessels in the halibut fleet from the early sixties onwards, decreased competition considerably. As a result, the Seattle, Vancouver, and Prince Rupert based fleets spent more time fishing far western Alaskan waters, and elected to land a considerable percentage of their catch at ports in western Alaska.

The breakdown of landings by ports is given in Table XII and represents approximately 95% of total landings during the 1952-1972 period. The remaining landings were made mainly by the small boat fishery at a considerable number of stations from Washington to Alaska. The emergence
Table X

Landings by Sub-Region for Each of the Four Periods and Percentage of the Total Catch From Grounds West of Cape Spencer

<table>
<thead>
<tr>
<th>Period</th>
<th>Wash.</th>
<th>% Of Total Catch</th>
<th>% Of Total Catch</th>
<th>% Of Total Catch</th>
<th>% Of Total Catch From Grounds West Of C. Spencer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1888-1912</td>
<td>13,519</td>
<td>61</td>
<td>7074</td>
<td>34</td>
<td>1000</td>
</tr>
<tr>
<td>1913-1931</td>
<td>15,046</td>
<td>31</td>
<td>25749</td>
<td>52</td>
<td>8168</td>
</tr>
<tr>
<td>1932-1951</td>
<td>16,428</td>
<td>31</td>
<td>21149</td>
<td>41</td>
<td>14837</td>
</tr>
<tr>
<td>1952-1972</td>
<td>13,890</td>
<td>22</td>
<td>24800</td>
<td>40</td>
<td>23600</td>
</tr>
</tbody>
</table>
Table XI

Average Annual Landings in Millions of Pounds, and Percentage of Total Average Annual Catch By Port Area For Each Period

<table>
<thead>
<tr>
<th>Period</th>
<th>Puget Sound</th>
<th>Lower Mainland</th>
<th>Prince Rupert Area</th>
<th>Southeast Alaska</th>
<th>West Central Alaska</th>
</tr>
</thead>
<tbody>
<tr>
<td>1888-1912</td>
<td>13.5 Mill. (61%)</td>
<td>5.9 Mill. (27%)</td>
<td>.1 Mill. (4%)</td>
<td>1.0 Mill. (5%)</td>
<td>--</td>
</tr>
<tr>
<td>1913-1931</td>
<td>15.4 Mill. (31%)</td>
<td>3.0 Mill. (6%)</td>
<td>18.7 Mill. (38%)</td>
<td>9.6 Mill. (19%)</td>
<td>1.1 Mill. (2%)</td>
</tr>
<tr>
<td>1932-1951</td>
<td>16.4 Mill. (31%)</td>
<td>2.5 Mill. (5%)</td>
<td>15.7 Mill. (31%)</td>
<td>13.0 Mill. (25%)</td>
<td>1.0 Mill. (2%)</td>
</tr>
<tr>
<td>1952-1972</td>
<td>13.8 Mill. (22%)</td>
<td>5.5 Mill. (8%)</td>
<td>17.0 Mill. (27%)</td>
<td>15.9 Mill. (26%)</td>
<td>7.7 Mill. (12%)</td>
</tr>
</tbody>
</table>

1. Puget Sound includes Seattle, Bellingham and a number of minor ports.
2. Lower Mainland includes Vancouver and immediate area, i.e. Steveston.
3. Prince Rupert Area includes Prince Rupert, Butedale, and Queen Charlotte Island Ports, i.e. Massett.
4. Southeast Alaska includes Ketchikan, Wrangell, Petersburg, Juneau, Pelican, Sitka and minor ports.
5. West C. Alaska includes Seward, Kodiak, Sand Point, Cordova, Port Williams, Seldovia and minor ports.
<table>
<thead>
<tr>
<th>Year</th>
<th>Seattle</th>
<th>Bell-</th>
<th>Vancouver</th>
<th>Prince</th>
<th>Wrangell</th>
<th>Petersburg</th>
<th>Sitka</th>
<th>Pelican</th>
<th>Juneau</th>
<th>Cordova</th>
<th>Seward</th>
<th>Kodiak</th>
<th>Sand Point</th>
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</thead>
<tbody>
<tr>
<td>1952</td>
<td>11299</td>
<td>(400)</td>
<td>2400</td>
<td>19686</td>
<td>7696</td>
<td>430</td>
<td>3022</td>
<td>2023</td>
<td>2244</td>
<td>2645</td>
<td>--</td>
<td>--</td>
<td>676</td>
</tr>
<tr>
<td>1953</td>
<td>12985</td>
<td>(500)</td>
<td>4572</td>
<td>18086</td>
<td>4823</td>
<td>368</td>
<td>2847</td>
<td>1662</td>
<td>2829</td>
<td>1706</td>
<td>689</td>
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<td>1027</td>
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<td>1954</td>
<td>16140</td>
<td>(600)</td>
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<td>14626</td>
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<td>1956</td>
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<td>(900)</td>
<td>5651</td>
<td>15689</td>
<td>5741</td>
<td>660</td>
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<td>1789</td>
<td>8495</td>
<td>15733</td>
<td>6263</td>
<td>660</td>
<td>3972</td>
<td>1234</td>
<td>1973</td>
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<td>--</td>
<td>116</td>
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<td>1960</td>
<td>13070</td>
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<td>16915</td>
<td>9498</td>
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<td>1961</td>
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<td>4527</td>
<td>17786</td>
<td>10806</td>
<td>747</td>
<td>5904</td>
<td>1333</td>
<td>1910</td>
<td>1912</td>
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<td>1962</td>
<td>11879</td>
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<td>1344</td>
<td>2169</td>
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<td>1005</td>
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<td>2570</td>
<td>5739</td>
<td>18837</td>
<td>7052</td>
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<td>4248</td>
<td>472</td>
<td>1162</td>
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<td>2346</td>
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<td>20401</td>
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<td>363</td>
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<td>1824</td>
<td>--</td>
<td>666</td>
<td>4382</td>
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<td>1966</td>
<td>8176</td>
<td>2087</td>
<td>7048</td>
<td>9838*</td>
<td>7734</td>
<td>401</td>
<td>4818</td>
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<td>1358</td>
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<td>3325</td>
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<td>3018</td>
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<td>643</td>
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<td>11</td>
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<td>3255</td>
<td>4573</td>
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<td>2875</td>
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<td>3806</td>
<td>720</td>
<td>1405</td>
<td>1717</td>
<td>15</td>
<td>4046</td>
<td>8698</td>
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<td>2005</td>
<td>2664</td>
<td>3996</td>
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<td>1263</td>
<td>1446</td>
<td>1223</td>
<td>--</td>
<td>3611</td>
<td>9217</td>
</tr>
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</table>

* Due to vessel share dispute the Seattle fleet did not depart for fishing grounds until May 1, although season opened March 25.
* Strike at Prince Rupert
of major new halibut centres during the period contributed to further increased decentralization of the landing/processing sector. There occurred increased competition amongst the halibut ports for a share of total catches throughout the period. The port to suffer most from such diversification of landings was Seattle. Sand Point, Alaska developed into a major centre for part of the period. However, heavy fishing pressure on Bering Sea stocks after 1963 resulted in a considerable decrease in catch. Sand Point's role in the industry was centred around exploitation of the Bering Sea grounds. Therefore, the port declined with the decrease in catches from the Bering Sea.

In 1970 landings at Kodiak surpassed those of Seattle and replaced the latter as the second leading halibut centre of the Eastern Pacific in terms of primary landings. As in previous periods, Seattle maintained its dominant position as the leading marketing and administrative centre for the industry as a whole. Most of the halibut frozen in Alaska continued to be forwarded to final markets via Seattle. Greater landings by the larger vessels outside the longer established centres occurred as a result of decreased disparity in port halibut prices and the extended length of the fishing season.

Table XIII shows the percentage of the total catch landed at the leading halibut ports for various years throughout all four periods. The decline of the older ports and the increasing importance of emerging ports is quite apparent. By the end of the 1952-1972 period, ports with relatively large fleets were no longer assured of large landings of halibut. For example, Seattle with a fleet of approximately 50 vessels in 1971 received only 4% of the total catch, whereas Kodiak with a much
### Table XIII

Percent of the Total Catch Landed at Each Port for Various Years.

<table>
<thead>
<tr>
<th>Year</th>
<th>Seattle</th>
<th>Vancouver</th>
<th>Prince Rupert</th>
<th>Ketchikan</th>
<th>Petersburg</th>
<th>Sitka</th>
<th>Pelican</th>
<th>Juneau</th>
<th>Seward</th>
<th>Kodiak</th>
<th>Sand Point</th>
<th>Bellingham</th>
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<tr>
<td>1900</td>
<td>(50)</td>
<td>(24)</td>
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<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1912</td>
<td>(37)</td>
<td>28</td>
<td>5</td>
<td>(9)</td>
<td>1</td>
<td>--</td>
<td>&lt; 1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>1920</td>
<td>27</td>
<td>7</td>
<td>41</td>
<td>13</td>
<td>1</td>
<td>2</td>
<td>&lt; 1</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
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<tr>
<td>1931</td>
<td>34</td>
<td>2</td>
<td>38</td>
<td>13</td>
<td>1</td>
<td>&lt; 1</td>
<td>3</td>
<td>&lt; 1</td>
<td>--</td>
<td>--</td>
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<td>1960</td>
<td>25</td>
<td>13</td>
<td>23</td>
<td>9</td>
<td>5</td>
<td>1</td>
<td>3</td>
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<td>&lt; 1</td>
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<td>1971</td>
<td>4</td>
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<td>5</td>
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<td>3</td>
<td>3</td>
<td>8</td>
<td>20</td>
<td>1</td>
<td>6</td>
</tr>
</tbody>
</table>

Source: Pacific Fisherman Yearbook(s).
IPHC Reports.
smaller fleet accounted for 20% of the total catch. Better marketing facilities at western locations no longer favoured frequent movement between home port and the major halibut producing grounds. The one exception being Prince Rupert with a fleet numbering approximately 80 vessels in 1971, most of which fished short distances from the port, and elected to land their catches at home port.

Spatial interaction between the catching and landing/processing sectors of the halibut industry underwent further transformation during the period. This, in part, was largely related to vessel behavior, although further expansion in the cold storage sector of the industry, increased decentralization of landings amongst the various ports. During the previous periods, exploitation of grounds west of Cape Spencer was not accompanied by any major shift in landings of halibut to that region despite the presence of cold storage facilities. The shift westward was reflected in fewer vessels electing to land catches at ports further south. For example, the number of halibut vessel deliveries to Seattle decreased from 514 in 1952 to just 22 in 1972. By the end of the 1952-1972 period there was every indication that these ports in western Alaska would continue to account for a large percentage of the total annual catch.

Prior to 1950 reciprocal port privileges were maintained on a year to year basis. In 1950, the Convention Between the United States and Canada for the Extension of Port Privileges to Halibut Fishing Vessels was signed. This move contributed to a more harmonious fishery since it established by Convention what was previously an ad hoc arrangement.

The Halibut Convention of 1953 changed the name of the halibut
regulatory body from the International Fisheries Commission to the International Pacific Halibut Commission (IPHC). The Commission was directed by the American and Canadian governments to take measures to provide for maximum sustainable yields within the fishery. As a result, certain sections of grounds were only open for part of the fishing season, and in both areas (2 and 3) a split-season was introduced. In Area 2, an extra fishing period of seven days lasted until 1960, after the main fishing season had ended. An Area 3, the same pattern of split-seasons was still in effect at the end of the 1972 fishing season. This management move was designed to concentrate effort in relation to availability of halibut at different times of the year over sections of the grounds.

Functional Structure

The functional structure of the industry remained unchanged from the previous period with the exception of an increasing tendency to bypass the halibut exchange. At Prince Rupert in particular, members of the Prince Rupert Fisherman's Co-Operative Association were selling their catch direct to the co-operative. Other vessels in the halibut fleet were also selling direct to other firms in the industry. This was causing concern because it was felt that the exchange was maintaining prices offered to fishermen. If more and more fishermen were to sell their catch direct to buyers then the whole marketing structure would be placed in jeopardy.
Industry Control

The shortened fishing season and the influx of vessels into the halibut fleet had placed the industry in a chaotic condition by 1955. Catches had increased and heavy landings of halibut over the short fishing season decreased prices considerably. For example, the average price of halibut landed at British Columbia ports decreased from 20 cents per pound in 1950 to 13 cents per pound in 1955.\(^{12}\)

Commencing in the 1956 fishing season the halibut fleet voluntarily instituted a layover program to stretch out the length of the fishing season. This was an attempt to combat low prices paid for heavy landings of halibut. Each vessel in the entire fleet was to remain in port seven days after the completion of each trip.\(^{13}\) This was increased to eight days several years later. The layover program led to: (1) an increase in the length of the fishing season, (2) a decrease in the number of vessels in the fleet, (3) a reduction in price fluctuations which accompanied the shortened fishing season, and (4) a more orderly marketing procedure at the halibut ports.

The increasingly shortened fishing season had placed severe strain upon the catching, processing, and marketing sectors of the industry. The increase in the duration of the halibut fishery no longer made it possible for annual quotas to be taken before the peak of the salmon fishery. Therefore, a large number of salmon fishermen who engaged in the halibut fishery part-time no longer found it worthwhile to fish for halibut.

Figure 33 shows how the length of the fishing season for halibut increased greatly after introduction of the layover scheme in 1956.
* QUOTA NOT REACHED IN AREA 2 IN 1963, 1967 and 1971
**INCLUDES SPLIT-SEASON PERIODS
Potential effort was now spread over a longer period. As a result the annual quotas were taken over a longer time period. The length of the halibut season on grounds south of Cape Spencer increased from 36 days in 1952 to 178 days in 1971. On grounds west of Cape Spencer it increased from 77 to 242 days for most grounds.

Table XIV shows the number of vessels and men engaged in the halibut fishery during the 1952-1972 period. The sharp downward trends reflected a pattern of increased specialization within the fishery, although more multi-purpose vessels are being added to the Canadian sector of the industry in particular. For example, in 1960 there were 31 longliners, 42 seiner-longliners, and 40 longliner-packers in the British Columbia halibut fleet. In addition, there was a high number of troller-longliners in the fleet. In 1969 there were 28 longliners, 52 seiner-longliners, and 59 troller-longliners in a much smaller B.C. fleet. Some vessels in all of these categories engaged in packing salmon and herring from time to time.

Because of a state law restricting the size of the Alaska salmon fleet to vessel sizes less than 49.5 feet, multi-purpose vessels have not developed to the extent they have in British Columbia. This has therefore limited the number of vessels in the Alaska halibut fleet. In Alaska, salmon is king, and most fishermen, including halibut fishermen fish for this species. If they wish to fish for both halibut and salmon from the same vessel it must not exceed 49.5 feet. This explains why most of the vessels at Southeast Alaska ports are confined to near shore waters and are indirectly forced to sell their catch at ports in the immediate vicinity. In western Alaska, however, the decline of the
Table XIV

Number of Vessels and Men Engaged in the Halibut Fishery 1952-1972, and Percentage of the Catch From Each Area By Canadian and American Fleets

<table>
<thead>
<tr>
<th>Year</th>
<th>Total Vessels/Men</th>
<th>Canadian Vessels/Men</th>
<th>American Vessels/Men</th>
<th>Total Vessels/Men</th>
<th>Canadian Catch</th>
<th>American Catch</th>
<th>Total Catch</th>
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<tr>
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</table>

Source: IPHC Reports.
King crab fishery has resulted in a number of vessels entering the halibut fishery.

During the period the number of vessels in both the United States and Canadian halibut fleets declined but at different rates. In the United States fleet a number of older vessels (built in the 1920's) were retired and not replaced resulting in a sharp decrease in fleet size. In Canada the total reduction has been somewhat lower because of government subsidies towards the cost of fishing vessel construction. As a result there has been a steady increase in the Canadian percentage of the Eastern Pacific halibut catch.

The most severe decline in halibut prices in the regulated phase of the fishery occurred during the 1967 and 1968 fishing seasons. Halibut prices fell sharply over the whole region with the average landed price at Seattle dropping from 36.2 cents per pound in 1966 to 25.3 cents in 1967 and 1968. The average price for halibut landed in British Columbia dropped from 35.4 cents to 25.6 cents over the same period. Such a decrease in prices was the result of expansion of the Newfoundland longliner fleet which saw turbot production increase from 3.6 million pounds in 1964 to 32.6 million pounds in 1967. Most of this output was marketed in North American halibut markets under the trade name "Greenland halibut," and competed in the whitefish market with Pacific halibut.

In fact, the turbot is not a member of the halibut family, but a low-priced flounder species. It appeared, however, that the consumer could not differentiate between turbot and halibut because market surveys conducted by the Pacific halibut industry "showed the consumer to be con-
west and deceived." A decision of the United States Supreme Court made it illegal for eastern buyers to sell turbot under the label "Greenland halibut." Its marketing brand name change to Greenland turbot restored halibut prices to previous levels.

The reduction of the 1972 quota to 40 million pounds, the lowest in the regulated phase of the halibut fishery, promoted intense competition between buyers for a share of the catch. There was also increased competition on the fishing grounds as well amongst fishermen. The 1971 quota of 53 million pounds was not reached, and as a result there was very little frozen halibut on hand at the beginning of the 1972 fishing season. In addition, groundfish production from eastern Canadian waters was down significantly.

This favoured increased consumption of halibut in the North American whitefish market. The Newfoundland catch alone, which is almost entirely marketed in the American halibut markets, was down from 705 million pounds in the first eight months of 1971 to 469 million pounds over the same period in 1972. Such a combination of factors resulted in a phenomenal increase in the landed price of halibut. The average price paid at Seattle in 1972 was 62.8 cents per pound compared with 36.0 cents per pound in 1971. In terms of returns to fishermen, the increase in price more than compensated for the record low catch in the quota-regulated phase of the fishery.

Figure 34 shows the trends in catch, yield, and effort for the 1952-1972 period. Greater yearly catches were taken from Area 3 than in the previous period and reflected the development of the Bering Sea grounds and greater effort being expended on grounds throughout the area.
FIGURE 34. TRENDS IN CATCH, EFFORT, YIELD 1952–1972.

CATCH (MILLIONS OF POUNDS)

AREA 3

CATCH PER SKATE (HUNDREDS OF POUNDS)

EFFORT (THOUSANDS OF SKATES)


CATCH (MILLIONS OF POUNDS)

AREA 2

CATCH PER SKATE (HUNDREDS OF POUNDS)

EFFORT (THOUSANDS OF SKATES)


--- CATCH
--- EFFORT
--- CATCH PER SKATE
Yields decreased in part because of more effort being employed on less abundant stocks over a much longer fishing season. On grounds south of Cape Spencer (Area 2) there occurred a sharp decrease in the amount of gear employed over that of the previous period. Average yields per skate remained fairly stable after 1962, but the yearly catch declined. It may have been that quotas on these grounds were set too high in the initial years of the period. If this were the case, fewer fish would have been added to the halibut population in the years immediately after, especially if effort were maintained at high levels.

**The Small Boat Sector**

In the initial phase of the fishery the abundance of halibut on inshore grounds made it possible for small boats of less than 5-10 tons to engage in the halibut fishery. With the development of a deep-sea fishery after 1910, with most vessels operating from the major ports of Seattle, Vancouver, Prince Rupert, and Ketchikan, the role of the small boat fishery declined. In essence, this gave rise to centralization of landings by the regular halibut fleet. The spatial range of the small boats limited them to near shore grounds, and with the possible exception of Alaskan waters, depletion of stocks on these banks no longer made for an intensive small boat fishery.

Halibut banks in Alaska waters are more extensive than those further south. Therefore, they were not as extensively over-fished as the smaller, more southerly grounds. As a result, the small boat sector of the Alaska halibut fishery proved to be longer lasting than that farther south. The presence of deep-water channels in Southeast Alaska, in which halibut
generally stayed throughout the year without much offshore movement, also favoured the small boat fishery in Alaska. By 1931, however, the small boat sector of the Eastern Pacific halibut fishery was only taking approximately 3% of the total halibut catch.\(^{25}\)

In addition to the 500-600 one and two man boats\(^{26}\) which have benefited from increased halibut stocks on inshore grounds since quota regulation, a large number of vessels in the salmon trolling fleet account for incidental catches of halibut. Most effort by the latter is exerted in the spring months before the peak of the salmon season, in years when salmon runs are poor, or when halibut prices are high. Although they employ less effort and gear, their total percentage of the halibut catch increased from 3% in the 1931-1935 period to 10% in the 1950-1955 period.\(^{27}\) Larger and more efficient trollers in the Pacific Salmon fleet have also contributed to such an increase in their landings.

Essentially, the small boat sector of the part-time halibut fleet carries out a near-shore fishery over grounds throughout the region. Although the largest volumes of their catch are landed at the many salmon and halibut camps along the coastline, some of the catch may be landed directly at the major ports. In British Columbia alone in any given year there may be 25 or 30 locations at which small quantities of halibut are landed. Most of these isolated stations are predominately engaged in handling salmon. Centralization within the salmon canning industry has contributed to a decrease in the number of such locations. For example, such cannery sites as Klemtu, Namu, and Butedale which no longer support canneries all had halibut holding facilities in
conjunction with salmon processing facilities. Between 1940 and 1960, halibut landings at Butedale amounted to over 100 thousand pounds annually, although they were far greater during the 1913-1931 phase of the fishery.

Improvements in vessel design and refrigerator facilities have greatly increased mobility within the salmon trolling fleet. Their relatively small carrying capacities, however, combined with their small crew size (1-2 men), do not present the type of scale of operations which is characteristic of the regular halibut fleet. This also holds for the small boat sector of the halibut fleet. The latter's existence in the fishery is primarily due to availability of halibut on grounds less than 10-15 miles from bases of operation. Their low operating costs, together with high prices received for halibut, make it possible for them to remain in the fishery even when catches are small. Most fishermen in the small boat sector of the industry may only engage in the fishery part-time, and their numbers fluctuate from year to year in the same manner as those engaged in the larger vessel-sized fleet.

The operational characteristics of the small boat sector is representative of the initial phases of the halibut fishery, when day-to-day operations were conducted from small fishing stations throughout the entire region. In an unregulated fishery their role would have declined to the point where it would be no longer feasible for them to engage in fishing operations. In the case of the Pacific halibut fishery, however, quota regulation has contributed to increased landings by the small boat sector of the fleet.

Unlike vessels in the trolling fleet, for example, the Pacific trawler fleet is not permitted to retain incidental catches of halibut. The Commission (IFC) prohibited the retention of otter trawl-caught halibut
in 1944, but this has not prevented the expansion of the trawler fleet. From biological evidence it was shown by the Commission that otter trawls are less selective than setline gear (longlines) and account for a very high proportion of immature halibut. Consequently, all otter-trawl caught halibut must be returned to the sea. Trawler fishermen, however, have since advocated that they be permitted to retain incidental catches of halibut.

The Bering Sea Fishery

Although isolated trips to the Bering Sea halibut grounds had been made as early as 1930, development of the fishery in these waters only commenced in 1952. Improved halibut stocks on the older grounds after 1932; the lack of adequate marketing and outfitting facilities at far western Alaska locations; and price disparity in favour of the southern ports were factors which affected the relatively late development of the Bering Sea fishery. With the construction of cold storage facilities at Sand Point in the early nineteen fifties, fishermen shifted more effort to the Bering Sea grounds.

Table XV shows the number of vessels operating in the Bering Sea between 1952 and 1972, and the North American catch from the area. Canadian vessels were late in exploiting those grounds which was the result of their increased tendency to fish grounds west of Cape Spencer after 1958. Such a move coincided with the addition of subsidy-built vessels to the Canadian fleet. A greater number of vessels in excess of sixty tons were added and this made it possible to more effectively exploit grounds at increased distances from British Columbia ports.
Table XV

Number of Vessels Operating in Bering Sea and Catch ('000 lbs.) from Region During 1952-1972

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>Canada</th>
<th>U.S. and Canada</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of Vessels</td>
<td>Catch (lbs.)</td>
<td>No. of Vessels</td>
</tr>
<tr>
<td>1952</td>
<td>9</td>
<td>251</td>
<td>--</td>
</tr>
<tr>
<td>1953</td>
<td>6</td>
<td>227</td>
<td>--</td>
</tr>
<tr>
<td>1954</td>
<td>2</td>
<td>41</td>
<td>--</td>
</tr>
<tr>
<td>1955</td>
<td>1</td>
<td>45</td>
<td>--</td>
</tr>
<tr>
<td>1956</td>
<td>3</td>
<td>177</td>
<td>2</td>
</tr>
<tr>
<td>1957</td>
<td>1</td>
<td>39</td>
<td>--</td>
</tr>
<tr>
<td>1958</td>
<td>7</td>
<td>965</td>
<td>14</td>
</tr>
<tr>
<td>1959</td>
<td>19</td>
<td>1777</td>
<td>20</td>
</tr>
<tr>
<td>1960</td>
<td>35</td>
<td>2308</td>
<td>31</td>
</tr>
<tr>
<td>1961</td>
<td>34</td>
<td>2040</td>
<td>27</td>
</tr>
<tr>
<td>1962</td>
<td>43</td>
<td>3820</td>
<td>33</td>
</tr>
<tr>
<td>1963</td>
<td>51</td>
<td>3323</td>
<td>53</td>
</tr>
<tr>
<td>1964</td>
<td>36</td>
<td>1072</td>
<td>32</td>
</tr>
<tr>
<td>1965</td>
<td>19</td>
<td>745</td>
<td>15</td>
</tr>
<tr>
<td>1966</td>
<td>4</td>
<td>557</td>
<td>11</td>
</tr>
<tr>
<td>1967</td>
<td>17</td>
<td>1287</td>
<td>19</td>
</tr>
<tr>
<td>1968</td>
<td>11</td>
<td>653</td>
<td>17</td>
</tr>
<tr>
<td>1969</td>
<td>7</td>
<td>565</td>
<td>16</td>
</tr>
<tr>
<td>1970</td>
<td>6</td>
<td>245</td>
<td>13</td>
</tr>
<tr>
<td>1971</td>
<td>4</td>
<td>137</td>
<td>13</td>
</tr>
<tr>
<td>1972</td>
<td>4</td>
<td>475</td>
<td>7</td>
</tr>
</tbody>
</table>

Because of increases in the price of halibut landed at ports relatively close to the Bering Sea, little benefit was derived from landing catches at ports a considerable distance away. In addition, there was less competition in the stormy Aleutian region and vessels could benefit from potentially higher catches. Overfishing on the Bering Sea grounds, however, led to a sharp decrease in catch and as a result fewer vessels were venturing into the area by the end of the 1952-1972 period.

In order to make for a more even distribution of fishing effort over the Pacific halibut grounds and to gain greater knowledge of the Bering Sea halibut stocks, the Halibut Commission encouraged movement of North American vessels into the area. For example, the fishing season started earlier than on the southern grounds.

Russia commenced otter trawl operations for groundfish in the Bering Sea in the late nineteen fifties. In 1961 the Japanese began halibut operations in the area and in that year produced 24.2 million pounds of halibut. Continued operations in succeeding years reduced stock levels in the Bering Sea considerably. International Pacific Halibut Commission tagging experiments had shown that halibut stocks in the Bering Sea contributed to stock size on grounds west of Cape Spencer. Therefore, by the end of the 1952-1972 period such overfishing was reflected in record low quotas for the industry as a whole.

Movement of Japanese vessels, in particular, into the Bering Sea caused grave concern to those involved in the North American halibut industry. In 1962, the Convention for the High Seas Fisheries of the North Pacific Ocean of Canada, Japan and the United States agreed that halibut stocks of the eastern Bering Sea did not qualify for abstention
as specified in the International Convention for the High Seas Fisheries of the North Pacific Ocean. Since 1965 halibut stocks of the Bering Sea have been managed jointly by the International Pacific Halibut Commission and the International North Pacific Fisheries Commission. The catch in the area has been taken by Japan, Canada, and the United States. As a result, the North American halibut fleet has to compete with a foreign fleet for catches in the Bering Sea and no longer has complete control over the entire Pacific halibut fishery.

Extension of the North American halibut fishery into the Bering Sea was carried out only by the largest vessels in the halibut fleet. In addition, the King crab fishery in Western Alaska waters expanded considerably after 1960 and some of the vessels engaged in this fishery shifted to halibut in the off-season. This trend accelerated after 1967 when king crab stocks began to show evidence of depletion. Most of the vessels operated on the grounds along the southeastern edge of the Bering Sea continental shelf. In this locality temperature conditions for halibut are more favourable than over most areas of the shallow shelf of the region. Consequently, halibut fishing in the Bering Sea was concentrated, rather than spread over relatively large expanses of fishing ground as was the case in the Gulf of Alaska. As a result halibut stocks in the former area were subject to intensive fishing effort.

Development of the Bering Sea grounds increased the distance between the older ports and the catch area for those vessels electing to exploit these grounds. Such extension of effort saw fishing activity being carried out approximately 2500 miles from Seattle and
Vancouver, and approximately 1800 miles from Prince Rupert and Ketchikan. It was no longer economically worthwhile to deliver every trip to the southern ports. Instead, vessels would deliver several or more catches of halibut at ports in western Alaska for every trip delivered to southern ports such as Seattle, Bellingham, and Vancouver. The final trip of the season was usually landed at the home port of the given vessels. Vancouver based boats, however, favoured ports on Puget Sound if there was a price discrepancy in favour of the latter.

The increased scale of operations of the far western cold storage sector was sufficient to bring about a reduction in operation costs and reductions in transportation costs of halibut being shipped to the southern railhead ports.\textsuperscript{37} Much of the activity was centred at Kodiak where 18 fish plants were operating in 1966,\textsuperscript{38} some of which were in the halibut business. The southern based vessels were frequenting the port with large numbers of halibut deliveries taken in western waters. This led to Kodiak developing into the second leading halibut centre of the Eastern Pacific in terms of primary landings.

The emergence of a dominant halibut centre in west central Alaska was of great significance. It culminated the general westward shifts which had occurred in the catching and processing sectors. As a result major halibut ports were located along the region's coastline from Cape Flattery to far western waters. This reflected the orientation of the catching and processing sectors to raw material supply. Other factors, however, such as the length of the fishing season, price disparity, and fleet competition helped shape spatial interaction within the industry during the period.
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5. Ibid. p. 12.


11. Information supplied by Mr. H. E. Lokken.


15. Ibid. p.8.


19. Information supplied by Mr. H. E. Lokken.


21. Information supplied by Economics Branch, Department of Fisheries, St. John's, Newfoundland.


24. Information supplied by Mr. H. E. Lokken.


28. Information supplied by Mr. N. R. Christensen, Canadian Fishing Company Ltd. Vancouver.


37. Information supplied by Mr. Donald McCleod, Manager, Atlin Fisheries Ltd. - Prince Rupert, Subsidiary of the New England Fishing Company Ltd.

Chapter VII
Summary and Conclusions

Examination of the historical economic development of fishing complexes suggests a concentric ring pattern of expansion and development. Evolution of the spatial structure of the Japanese skipjack-tuna fishery, the Peruvian anchovy fishery, the Newfoundland cod fishery, the Pacific salmon fishery, and most deep-sea fisheries of the world bear out such a pattern of development. Such a concentric pattern is associated with resource availability, resource depletion, nature of fishing grounds, institutional control, changing technology, etc. Changes or variation in these factors eventually determine the spatial structure of a given fishing complex and interaction between various sectors of the resource-based complex.

Activities associated with extractive industry tend to coincide spatially with raw material supply. In the case of a fishing complex the nature of the resource presents different problems than would be the case with a forestry resource, for example. In the case of the latter, resource inventories are more easily monitored and controlled. The common property nature of marine resources places limitations upon optimum exploitation. This, in itself, has important implications for the spatial and economic aspects of a fishery. Economic and biological characteristics of a given fishery, in turn, are a function of intensity of resource exploitation.

Variability of stock sizes of a fish resource, such as halibut, over expanses of fishing grounds has an important bearing on the type and
characteristics of the fishing complex which develops. Harvesting and locational decisions must be made in light of fish availability and accessibility. The harvesting of pelagic species, however, might call for a different set of constraints than would be the case for demersal species such as halibut. Most pelagic species such as salmon and tuna tend to range quite freely over broad expanses of ocean. Demersal species on the other hand are far more localized. In the case of the Pacific halibut, for example, vessels are forced to search out and capture different stocks of halibut which may occupy various grounds. With the Pacific salmon, however, the fishery could be prosecuted in such a manner that vessels would only have to await the arrival of the resource at Salmon rivers throughout the region.

The spatial structure of the halibut industry at all four stages of development is illustrated in Figure 35. In general, it shows the extension of the fishery and related activities in response to resource availability and accessibility. Depletion of the more southerly grounds and subsequent development of new grounds led to a generally northwesterly shift in effort and of the cold storage sector. The increased range of the catching sector was a function of fleet competition, fishing costs, and vessel design.

Figure 36 shows the degree of centralization of landings by port at each stage of development. In essence, increased decentralization of landings occurred at each stage with the extension of fishing activity. There was, however, a time lag between extension of fishing operations to the more westerly grounds and the rise of important landing ports near these grounds. This was largely related to price disparity in favour of
the more southerly ports. By the end of the study period this was not the case to such a large extent, and as a result other activities besides actual fishing operations were more closely oriented to raw material supply.

The concentric pattern of development arising from spatial extension of the Pacific halibut fishery is conceptualized in Figure 37. Essentially, the stage by stage evolution was accompanied by resource depletion under intensive fishing, a decline in the number of small ports, an increase in the spatial range of the catching sector within cost and technological constraints, and the emergence of major halibut ports closer to the fishing grounds. The amount of effort expended in each stage was largely a function of competition between vessels for a share of the halibut catch. Institutional controls placed constraints on levels of exploitation and proved to have important implications for transformation within the halibut complex.

Stage I (1888-1912) of the Pacific halibut fishery was characterized by virgin stocks which could be harvested with relatively low levels of technology. The major constraint placed upon rapid exploitation of the resource was related to market demand. Efficient transportation links were a pre-requisite for initial development and expansion of the fishery. The period was dominated by corporate involvement at all levels. Reduction of fishing costs and increased demand for halibut led to more attractive opportunities for the independent fishermen in the industry. Because of the nature of fish stocks and short range of the vessels in the fleet, spatial operations of the catching sector were quite limited. A large number of fishing stations were established from which a day-to-day fishery
FIGURE 37. CONCEPTUAL MODEL OF INDUSTRY EVOLUTION 1888–1972.
was carried on. The major ports of Seattle, Vancouver, and Tacoma emerged as the central nodes within the fishery. Until the final years of the period, the independent fleet was not sufficiently large to compete with the company-owned fleets. Increased northward migration of the catching sector in response to resource depletion of nearby grounds had increased the fishery range of the larger vessels to approximately 600 miles from the major ports. This led to expansion of the cold storage to northern points and heralded the future use of such ports as Prince Rupert and Ketchikan.

Stage II (1913-1931) of the fishery saw extension of fishing operations to all the halibut grounds with the exception of those in the Bering Sea. This resulted in grounds approximately 2000 miles from Seattle and Vancouver being exploited. Rapid expansion of the independent fleet resulted in greatly increased competition for annual catches. This further hastened the depletion of halibut stocks throughout the region, and led to the signing of the Halibut Convention in 1923. Depletion of stocks on inshore grounds led to the decline of the small boat fishery. In addition, expansion of the fishery to offshore grounds led to the introduction of the longliner vessels into the fishery of the company steamers. Completion of the rail link to Prince Rupert in 1914 provided the halibut fleet with a strategic base of operations, and had important implications for spatial interaction within the industry. The second period was therefore characterized by greatly increased investment to meet increased expansion requirements and market demands. This, however, led to underemployment of labour, capital, and equipment within the industry by the end of the period.
Stage III (1932-1951) saw little significant change in the spatial structure of the industry, but increased fishing effort was expended on western grounds. The institution of annual quotas led to a sharp decline in the duration of the fishing season and led to severe competition. Restoration of halibut stocks provided incentive for a large number of vessels to enter the fishery. This put added strain on the landing and marketing sectors of the industry. As a result the industry was forced to operate in a very uneconomical manner. Increased fishing costs associated with extreme fleet competition offset the gains which were achieved through stock restoration. Essentially the period was marked by a series of critical events. Record low prices in the non-pioneer phase of the industry during the early years of the 1932-1951 period contrasted with high prices and the largest vessel size fleet in the history of the fishing in the final years of the period.

Stage IV (1952-1972) saw the problem of excessive entry into the fishing being curtailed by the adoption of a voluntary between-trip layover program. This proved to be a very successful measure aimed at restoring order to the problem-plagued fishery. Extension of the fishery to the Bering Sea grounds was short-lived because of foreign fleet involvement in the halibut fishery for the first time. This led to depletion of the Bering Sea grounds and affected stock levels outside these grounds as well. Extreme competition from other whitefish species resulted in a sharp decrease in landed prices for halibut. By the end of the period catches were far below record high catches which were attained during the mid-nineteen fifties when stocks were tested at maximum sustained levels. The 1971 quota was not reached and led to the IPHC
setting the lowest quota in the regulated phase of the fishery during the 1972 fishing season. Accompanying such low quotas were record high prices, which reflected to a certain extent, the premium prices demanded by the world's limited supply of a highly valued food fish.

The evolution of the spatial structure of the Pacific halibut fishery represented industry response to availability of the halibut resource over different expanses of fishing grounds at various stages. The time-distance-cost factor between producing grounds and ports proved very critical in a fishery that was characterized by intensive vessel competition for a share of the catch. The competitive position of individual ports was largely a function of halibut price differentials between them.

The duration of the fishing season and the amount of effort expended, however, was to have important bearing on vessel-port interaction. The northwesterly shift of the cold storage sector accompanied the increased tendency of vessels to minimize the distances between the producing grounds and the landing/processing sector of the industry. Within certain price and cost constraints the fleet attempted to maximize the utility of various ports and fishing grounds (Figures 35 and 36).

Greater vessel mobility and range at each subsequent stage of development reduced the time-distance-cost factor of fishing operations because of innovations in vessel and engine design. The availability of better market opportunities at the more southerly locations (e.g. Seattle, Vancouver, Prince Rupert), minimized westward shifts in the landing/processing sector over much of the study period. Once intervening market opportunities occurred at points closer to the producing grounds (e.g. Kodiak), a shift to new landing ports occurred. The larger vessels in
the halibut fleet could readily adapt their operations to exploit the resource, but the smaller vessels in the fleet were far more spatially constricted (Figure 37). Figure 38 shows the increased tendency for vessels to land their catch away from the longer established ports.

Technological adaption (e.g. change in vessel type) proved to be a very important factor in affecting the degree of spatial interaction within the halibut complex. The distribution of the halibut resource over relatively confined fishing grounds placed spatial limitations on the spatial structure of the industry and interaction between components which comprised the halibut complex. Depletion of stocks on the inshore grounds, for example, no longer made it possible for small boats to engage in the fishery and led to a decline in small fishing stations from which these vessels operated and landed their catch. At the other extreme, the development of highly efficient and mobile vessels within the fleet made it possible for a greater range of locational and landing sites to be selected. In essence, home port ties were no longer maintained when resource exploitation occurred at considerable distances from home port, and intervening ports offered competitive opportunities, e.g. supplies, port and marketing facilities, and favourable halibut prices.

Approximately seventy years after initial commercial exploitation of the halibut resource, all halibut grounds of the Eastern Pacific had come under varying degrees of fishing pressure. Depletion of the virgin stocks occurred at a very fast pace but regulation of the fishery after 1924 helped restore stocks to generally healthy levels. As a result high catches and yields were maintained throughout the greater part of the regulated phase of the fishery (Figures 39 and 40).
FIGURE 38. TOTAL LANDINGS AND LANDINGS BY REGION 1888-1972.
Figure 39. Trends in catch, effort, yield for areas 2 and 3, 1888-1972.

Catch (Millions of Pounds)

Yield per Skate (Hundreds of Pounds)

Effort (Thousands of Skates)
Figure 40. Trends in catch, effort, yield for all grounds 1888-1972.
Industry cooperation and government interaction at the international level provided the basis around which effective management of the resource occurred. The restoration of halibut stocks is a classic example of what can be achieved if soundly based steps are taken in time to protect endangered fish stocks. Industry approval of IPHC regulatory measures will no doubt help reverse the catch declines which occurred in the final two years of the study period. Unlike most deep-sea fisheries of the world, the Pacific halibut fishery continued to be free of foreign fishing pressure and only to a very limited extent in recent years.

The common property nature of the Pacific halibut resource, like most marine species, affected economic returns which were generated within the fishery. In the early years of development when yields were high, and fishing costs relatively low, the catch was shared by a small number of vessels. Markets were slow developing, however, and because of over-production, prices paid to fishermen remained relatively low. With increased depletion of stocks and the need to go farther afield to take catches, fishing costs increased. In addition, a much longer time period was required to take annual catches. Decreases in catches were accompanied by generally increased halibut prices at dockside (Figure 41). This provided incentive for a larger number of vessels and fishermen to enter the fishery. As a result, the landed value of the catch was spread over a much larger fleet.

Regulation of fisheries on a quota basis is one of the most efficient measures to regulate fish stocks and maintain maximum sustained yields. With no restrictions on vessel entry into the halibut fishery, the quota system was accompanied by increased competition. Under intensive fishing
CATCH (MILLIONS OF POUNDS)

NUMBER OF VESSELS (HUNDREDS)

LENGTH OF FISHING SEASON (DAYS)

AVERAGE PRICE (CENTS PER POUND)*

*BASED ON B.C. PRICES

FIGURE 41. TRENDS IN NUMBER OF VESSELS, LENGTH OF FISHING SEASON, AVERAGE YEARLY PRICE 1888–1972.
effort the annual quotas were taken in far less time (Figure 40). This, in itself is a positive aspect of fisheries regulation but within limitations. In the case of the Pacific halibut fishery, as the fishing season shortened, more vessels entered the halibut fleet. Most of the vessels entering the fishery were vessels from the salmon fleet of the region.

The market was not capable of absorbing the greatly increased catches after stocks had improved and the entire catch was taken over a very short fishing season. The implications of this were twofold. Firstly, heavy landings of halibut over a much shorter fishing season tended to depress prices at the landing ports. Secondly, less of the catch could be absorbed fresh over a short landing period. As a result, greater amounts of halibut had to be held in cold storage for a longer duration of time which also tended to depress halibut prices. Therefore, unless measures were taken to stretch out the length of the fishing season, full economic benefits were not being derived from the fishery.

From an industry viewpoint the institution of the second voluntary between-trip layover program in the fourth stage of the fishery, had important implications for the halibut industry as a whole. Heavy landings associated with stocks being fished at maximum sustainable yield levels had created chaos within the industry. The increase in the duration of the fishing seasons which followed tended to restore stability to the halibut fishery. Apart from price declines related to external factors, the industry fared quite well in the final phase of the study period. The fishery was characterized by generally high halibut prices. A large reduction had occurred in the number of vessels engaged in the fishery. The increased length of the fishing season no longer made it possible for
salmon fishermen to readily engage in halibut operations. The catch was being taken with less effort, yields had stabilized, and the regular halibut fleet was benefiting from conservation and regulatory measures designed to create a greater degree of stability with the industry.

The development and expansion of the Pacific halibut fishery evolved around critical factors associated with resource availability and resource accessibility. Although these two factors determined the behavior of fishing vessels in the halibut fleet to a large extent, it was vessel response to economic and time constraints which determined the importance of various ports in the industry. This was manifested throughout the four stages of development. As a result, a combination of resource availability resource accessibility, technological change, and institutional controls determined the degree of spatial interaction within the industry as a whole. This in turn effected change in the spatial and functional structure of the Pacific halibut fishery throughout its evolutionary stages.
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