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FINAL REPORT--NOAA 2-35364

APPLICATION OF COMPUTER TECHNOLOGY
AND ADVANCED PHYSICAL DISTRIBUTION
TECHNIQUES TO SEAFOOD MARKETING

Donald F. Mulvihill
Leonard J. Konopa

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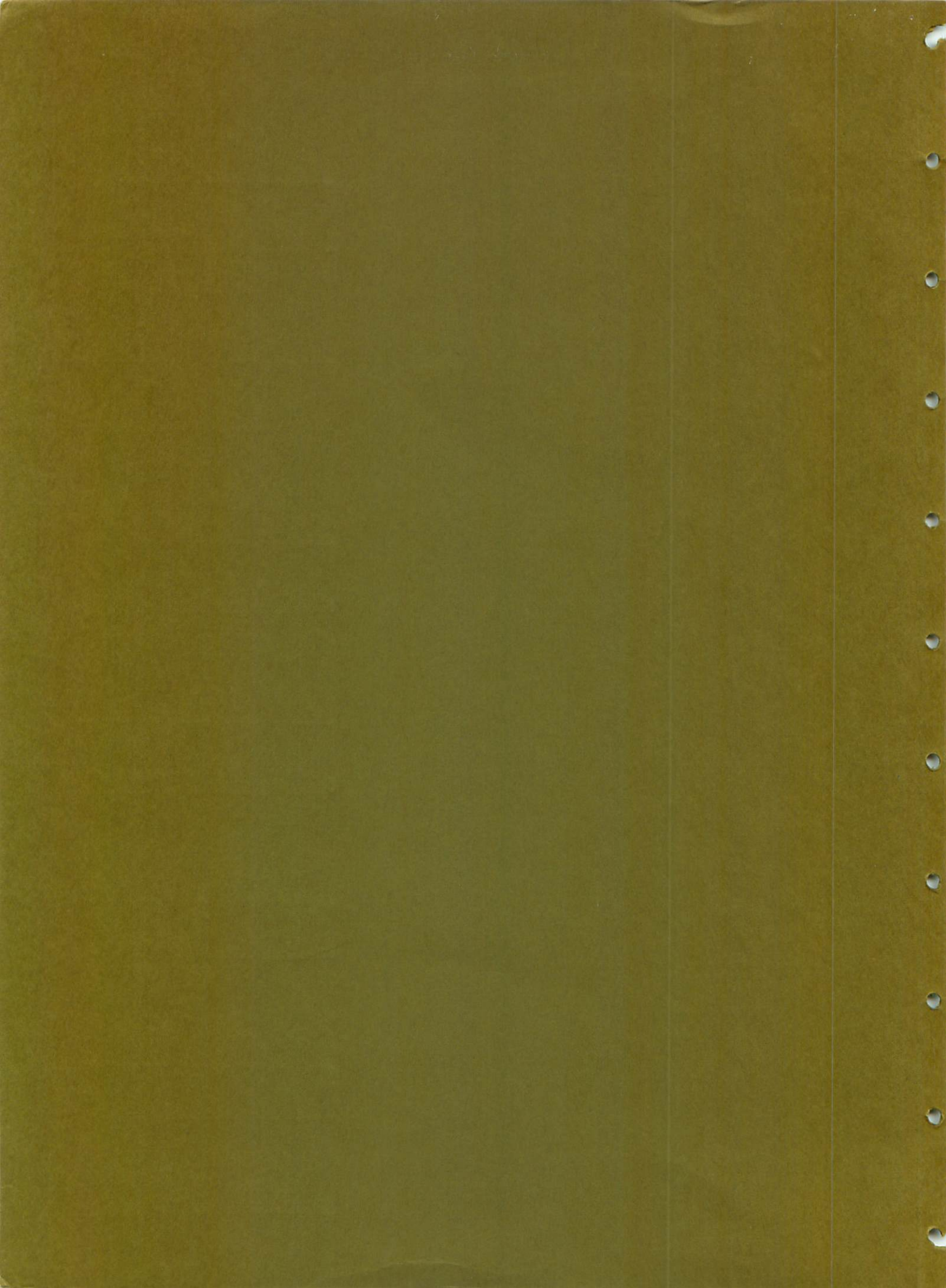
ENTURY BUSINESS

CENTER FOR BUSINESS AND ECONOMIC RESEARCH

COLLEGE OF BUSINESS ADMINISTRATION

KENT STATE UNIVERSITY

KENT, OHIO 44240



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College of Business Administration
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FOREWORD

A three-year Sea Grant project conducted at Kent State University begun in October, 1970, results in this final report. Dealing with the marketing of fresh coastal fish into the Midwest, it differs from the few other marketing studies made under such auspices. Rather than dealing with a particular specie or a fragment of the market, this study considers fish of all types, but particularly fresh fish as a consumer menu item. Even a cursory reading of the study will highlight certain concepts that differ from those often held in the industry while, at the same time, confirming on a more objective basis other concepts thought to be valid.

The participants, both the two co-principal investigators and the doctoral graduate students, began the study with few preconceived ideas as to the structure and operation of the fisheries industry. They are all grateful to the many industry members, from all levels of operations, that patiently answered questions that led to a better understanding of the problems present in this centuries-old activity. All of the project workers appreciate the participation of the approximately two hundred and fifty fishermen, processors, association leaders, middlemen, and transportation company representatives on both coasts and in the Midwest. To the 1700 household consumers who were kind enough to answer a rather lengthy questionnaire, the group is also indebted.

The doctoral students are thankful, not only for their fellowships, but also for the insights they gained of the research process. These students, some of whom have completed their degrees and used project data for their dissertations, were J. Steven Kelly, Charles W. Lamb, Jr., Cyril M. Logar, Albert V. Machamer, Suzanne E. Thom, Daniel F. Twomey, and Peter Sanchez. Two faculty members, Clifford T. Hancock and Robert F. Kramphf, provided valuable aid as consultants.

The support rendered by Dean Gail E. Mullin, College of Business Administration, and by the Office of Research Administration, Kent State University, is appreciated as is the assistance and patience of many members of the National Marine Fisheries Services of the National Oceanic and Atmospheric Administration. Among these should be noted John B. Glude (the originator of the proposal), Morton M. Miller, and Robert D. Wildman.

The hazardous job of providing secretarial assistance was shared by several highly competent workers, but Janet L. Daily, who filled this post for the first two years must be singled out for her ability to organize and aid in the supervision of the large scale mailing operations entailed in the survey work.

This complete series of studies of the fisheries industry and its marketing communications and physical distribution system, because of its overall approach, should be of value to members of the industry and governmental agencies, as well as students of marketing.

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The Freshwater Fish Marketing Corporation of Canada

A Marketing Communications and Physical Distribution
System to Provide the Midwest with Coastal Fish

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APPLICATION OF COMPUTER TECHNOLOGY, AND
ADVANCED PHYSICAL DISTRIBUTION TECHNIQUES TO SEAFOOD MARKETING

INTRODUCTION

This final report on a Sea Grant Project conducted at Kent State University dealing with the feasibility of the establishment of a marketing communications and physical distribution system to ensure a stable supply of fresh coastal fish into the Midwest serves to bring together the series of seven reports previously published. Rather than report the bulk of the information in those reports, the reports themselves are incorporated as appendices to this paper. In the interest of economy of reproduction, they are presented intact, thus presenting in a single volume all of the detailed information in each.

The proposed concept of a single communications system that, in its central memory, would have a record of all fresh fish available at one time and their location has merit in achieving an orderly physical distribution flow to distributors who desire to offer fresh fish to their customers. To achieve such a system, the necessary devices are available: remote reporting, computerized matching of supply items with demands, and delivery vehicles and systems. Unfortunately,

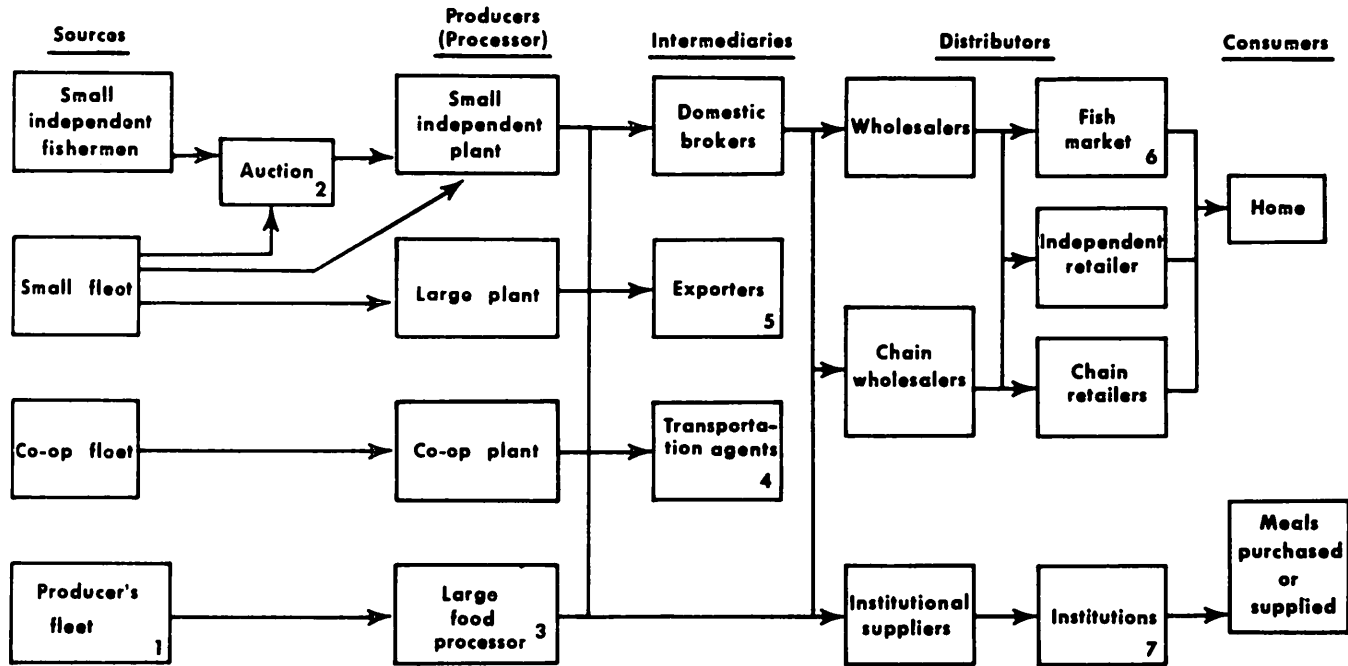
the lack of any one central organization of the supply agencies, the instability of the fish yields, and the chaotic world fisheries situation are a few of the factors that indicate that such a system is not practical, even though feasible. On the demand side, the Midwest wholesalers, retailers, and institutional users do not feel strongly that any such system is needed and that perhaps fresh fish is not an item that they should carry.

The total project is one of the few studies that deals with fish as a consumer menu item and looks at the entire marketing channel structure. Other studies are limited to a single specie, a portion of the channel institutions, or a short delivery distance. It was possible to establish a schematic model of the present distribution system (Figure 1) and of the proposed marketing communications system (Figure 2). For convenience, they are reproduced here. The detailed discussion of the system will be found in the last of the reports.¹

The question arose as to what kind of distribution system would ensure rapid delivery to the entire domestic market, not just those portions near the coastal sources of supply. Such a distribution system should provide a dependable supply of high quality fresh seafood throughout the United States.

¹Mulvihill, Donald F. and Leonard J. Konopa, A Marketing Communications and Physical Distribution System to Provide the Midwest with Coastal Fish, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1974.

FIGURE 1
Physical Distribution Channels in Fisheries Industry

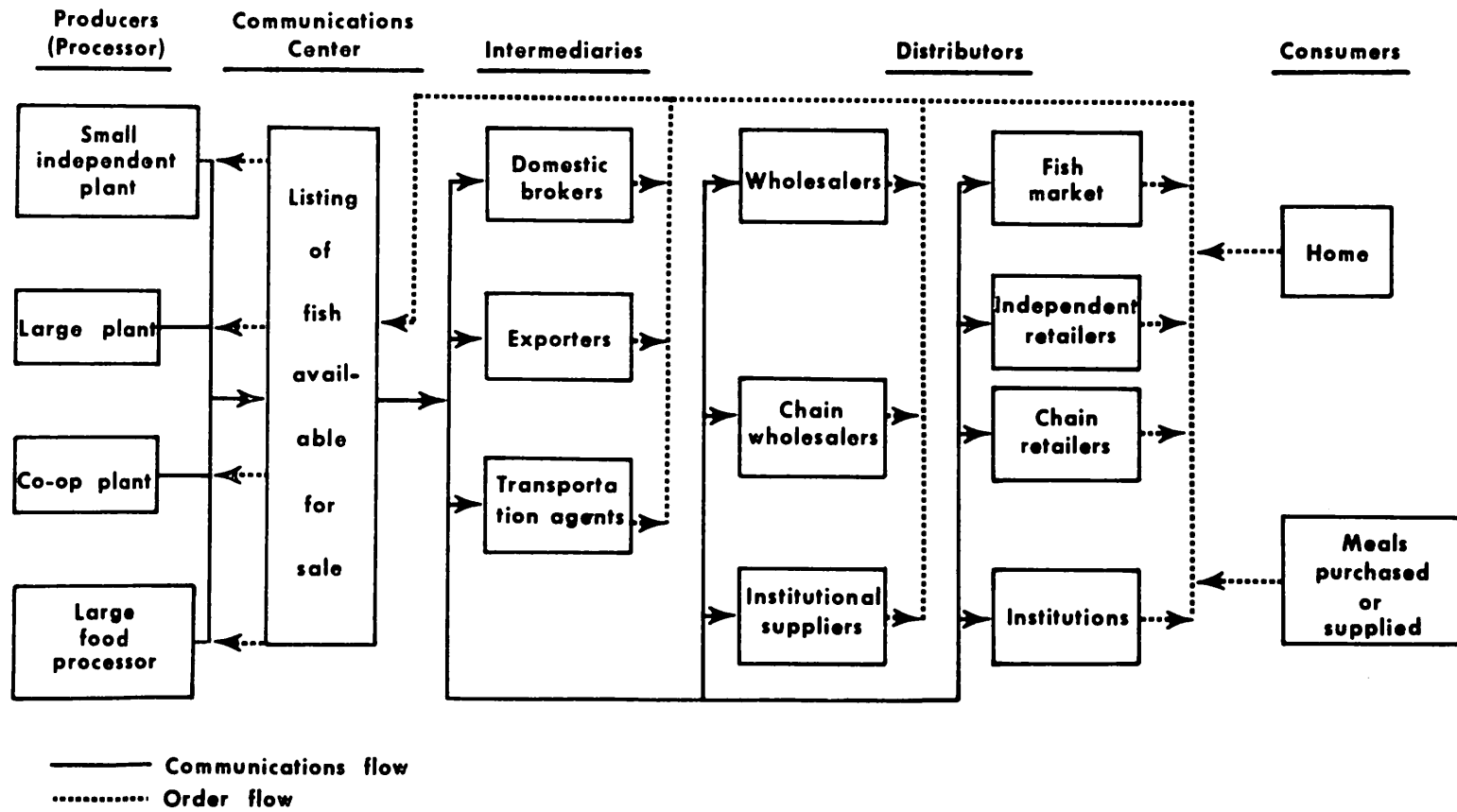


- 1 May be owned by food processors or financed.
- 2 Only for certain specie; to set price; a dying institution.
- 3 May finance small independent fisherman or small fleet owner.
- 4 Not strictly agents; airlines particularly may serve processor and distributor as communication agents.
- 5 Exported fish may move to distributors or processors overseas.
- 6 Fish specialty house is another dying institution; fish stalls in public markets present in coastal cities.
- 7 Includes restaurants (independent as well as fish specialist outlets), schools, hospitals, industrial plants.

Not all fish move through so complex a channel. In coastal areas, whole fish may move directly from fisherman to home consumer, with all other members of channel eliminated.

FIGURE 2

Possible Communications and Order Flow in Fisheries Industry with Computerization



The goal would be a system whereby retailers could order domestically-produced fresh seafood by telephone and delivery would be made within twenty-four hours or less.

Since little is known about the acceptance of fish as a menu item in households, or about the attitudes of middlemen in handling fish, particularly fresh fish, research was carried out at all these levels through sample surveys, using mail questionnaires and personal interviews. The greatest task was that dealing with consumers where over 1700 usable responses were obtained.

This field work resulted in a series of monographs reporting the attitudes of the household consumers,² retailers,³ wholesalers,⁴ and institutional users.⁵ The consumer

²Sanchez, Peter, and Leonard J. Konopa, Fish as a Household Menu Item, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1974.

³Konopa, Leonard J., Survey of Selected Retail Food Stores Handling Fish in Cuyahoga and Summit Counties, Ohio, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1973.

⁴Konopa, Leonard J., Survey of Wholesalers Handling Fish in Cuyahoga and Summit Counties, Ohio, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1973.

⁵Logar, Cyril M., and Donald F. Mulvihill, Survey of Institutional Users of Fish in Cuyahoga and Summit Counties, Ohio, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1973.

data based upon univariate and multivariate analysis were further refined by the use of the Automatic Interaction Detector (AID) program.⁶ Since it appeared that cooperative associations might be desirable to bring about a closer relationship between fishermen and processors, a study was made of a Canadian Crown corporation established to integrate the total fishing operation within the prairie provinces.⁷

ORGANIZATION OF REPORT

To summarize the reports previously published is one of the goals of this final publication. The organization of such a summary will follow in the order in which the separate reports will be found appended. Preceding this will be a brief historical statement and at the end there will be a presentation of external factors affecting the final conclusion and a brief statement of possible alternative courses of action.

⁶Machamer, Albert V., and Leonard J. Konopa, Market Segmentation by AID Analysis of Household Consumers of Fish in Cuyahoga and Summit Counties, Ohio, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1974.

⁷Lamb, Charles, and Donald F. Mulvihill, The Freshwater Fish Marketing Corporation of Canada, Kent, Ohio: Institute for 21st Century Business, Kent State University, 1974.

HISTORICAL BACKGROUND

On April 21, 1970, John B. Glude, associate regional director for fishery economics and services, Pacific Northwest Region, Bureau of Commercial Fisheries, now the National Marine Fisheries Service; and Harold L. Goodwin, Office of Sea Grant Programs, National Science Foundation, met with several members of the Department of Marketing at Kent State University to discuss Mr. Glude's proposal of a distribution system which would provide for the daily ordering and delivery of fresh seafood within 24 hours to every U. S. community of 2,500 or more people. The emphasis was on fresh seafood because of the U. S. industry's cost of catching and processing frozen or canned finfish and shellfish is higher than it is abroad. By contrast, the prohibition of foreign vessels landing fresh seafood at U. S. ports and the short shelf life of fresh seafood requiring rapid distribution should permit the U. S. fishing industry to compete effectively in the domestic fresh seafood market.

A proposal for a three-year study entitled "Application of Computer Technology and Advanced Physical Distribution Techniques to Sea Food Marketing" was subsequently submitted by Kent State University. The proposal was so set up that the first year's work would be essentially a "situation analysis" covering the distribution of all forms of fish as well

as the demand and attitudes of wholesalers, retailers, household consumers, and institutional users. To obtain this information, the principals would begin by assembling available material within the Sea Grant project office at Kent State University. After this material had been carefully reviewed, personal interviews would be conducted with government personnel, fishermen, processors, middlemen, trade association representatives, airlines, trucking companies, wholesalers, and retailers on the East coast and the Northeastern region of Ohio. Utilizing the Cleveland-Akron trading area, a random sample of households would be surveyed to find out what types of fish as well as how often fish were consumed at home; the respondents' attitude toward fish; and the demographic profile of regular versus irregular users. All of these activities were to provide information concerning such questions as:

1. Is the demand for fresh fish sufficient to support a sophisticated distribution system?
2. Is the demand for fresh fish likely to increase if consistent supplies of high quality fresh seafood are available generally?
3. Is the supply likely to increase with additional demand or will additional demand only result in higher prices due to a proportionally larger increase in demand than supply?
4. Are the wholesalers and retailers prepared to participate in a more sophisticated distribution system, and are they willing to promote and offer more fresh fish?

5. Are there adequate facilities presently available to permit application of streamlined ordering and delivery scheduling systems -- that is, computer technology and advanced physical distribution techniques?
6. Would the new system provide economic advantages due to lower costs, greater efficiency in processing, cold storage, transportation scheduling, and so forth?

Three different activities were envisioned during the project's second year. First, the data gathered when conducting the "situation analysis" would be combined and analyzed. Second, it was anticipated that the study would be expanded in the second year using either a national sample or a broad regional sample of Midwest states. A comparison of the second year's survey data with the first year's results would determine whether the first year's findings were supported and, as a consequence, could be generalized. Third, a model of the existing distribution system based on the first and second year's survey data was to be drawn up in the latter part of the second year. Hopefully, without too many modifications, this model of the existing distribution system could be adjusted to lay down fresh seafood in any community of 2,500 or more people within twenty-four hours of receipt of an order from any reseller.

In the third year of the project, the computer based order information system and the adjusted physical distribution techniques were to be tested. The results of three year's work then would be brought together with recommenda-

tions for those concerned.

Since the project was funded on an annual basis, it could be abbreviated or changed each fiscal period by the funding agency. This occurred at the end of the second year when the funds were reduced to 30 per cent of the budgeted sum originally anticipated. Moreover, the first year's "situation analysis" was scheduled to get under way in July, 1970, when the faculty coordinators as well as the five graduate students selected to participate in the program were available full time for ten weeks to interview people in all facets of the harvesting, processing, transporting, and marketing of seafood in the coastal regions as well as the Midwest. The funds to finance these activities, however, were not received until the end of the fall quarter. As a result, the project not only got underway much later than planned, but also it had to be modified since all of the people involved had academic commitments which precluded extensive travel off campus until the summer of the second year. To further complicate the situation, Kent State University lost two faculty members selected to participate in the project. One was an operations research systems analyst and the other was a transportation specialist. Due to the lag in starting the project because funds were delayed; the substantial reduction in funding the last year's activities; and the loss of key people, the follow-up regional survey as well as the construction and test of a

sophisticated ordering/distribution system were not undertaken as proposed. A substantial amount of substantive information in the form of six monographs, nonetheless, was derived from those portions of the study that were completed.

SURVEY OF WHOLESALERS HANDLING FISH IN CUYAHOGA
AND SUMMIT COUNTIES, OHIO

An exploratory survey among wholesalers and retailers in the two county area was conducted from April through August, 1971. The names of commercial fish and seafood wholesalers were obtained from the yellow pages of the area's telephone directories and from retailers. Chain store warehouses that handled fish for their retail outlets were also classified as wholesalers. A total of 28 wholesalers was identified in this manner. Each was mailed a pretested questionnaire and usable replies were received from 25 wholesalers.

Thirteen of the 25 wholesalers are classified as major line wholesalers while 12 are minor line wholesalers. A major line wholesaler is identified as one whose sales of fish range from 20 to 100 per cent of total sales whereas fish sales of a minor line wholesaler represent less than 20 per cent of total sales. The form of fish most widely handled by wholesalers is frozen fish. All 13 major line wholesalers and 12 of the minor line establishments stock frozen fish.

Canned fish ranks second with approximately 70 per cent of the wholesalers in each group handling canned fish. Fresh fish ranks third in number of wholesalers offering the product. Ten of the 13 major line and one of the 12 minor line wholesalers carry fresh fish.

A comparison of sales by form of fish handled indicates major line wholesalers are more likely to derive the major portion of their sales from whole or processed fish while minor line wholesalers rely on sales of prepared fish. Both groups, however, obtain most of their sales from frozen rather than fresh fish.

When asked which type of fish they preferred handling, major line wholesalers were about equally divided between fresh versus frozen fish. Minor line wholesalers, on the other hand, unanimously preferred frozen fish. Wholesalers who preferred offering frozen fish said they did so because (a) frozen fish was easier to handle; (b) it was cheaper due to the avoidance of direct labor processing cost as well as less waste and spoilage compared to fresh fish; (c) customers such as restaurants, institutions and even retailers preferred frozen fish because of portion control, less spoilage, and ease of handling. The wholesalers who preferred handling fresh fish said discriminating customers wanted fresh fish because it was tastier and looked better. They also said fresh fish was more profitable than frozen fish, although, curiously

enough, few wholesalers handling both fresh and frozen fish reported they marked up fresh fish more than frozen fish.

In terms of sales trends from 1966 to 1971, twenty-two of twenty-four wholesalers indicated their sales of frozen fish had increased. The sales trend for fresh fish, however, appeared to be declining in terms of total pounds sold although total revenue was up somewhat since price per pound was substantially higher in 1971 over 1966. Two-thirds of the respondents said their sales of canned fish had either recovered or exceeded their sales prior to the mercury scare that occurred in the fall of 1970. The increase in sales of frozen fish was attributed to such demand factors as ease of preparation; lesser price than most meat or fresh fish; population growth; rise in real income of consumers; awareness of the nutritional value of fish; and the emergence of weight watchers groups. On the supply side, they pointed at such factors as a consistent supply of frozen fish available all year; and improved quality of frozen fish; and the increase in number of drive-in restaurants and fish houses now supplying fish as a regular menu item. Any decline reported in the sale of fresh, frozen, or canned fish was blamed on the consumers' fear of eating contaminated fish, the Pope's relaxation of dietary requirements, and increased prices (especially of fresh seafood).

Nearly one-third of the wholesalers said they engaged in

"no promotion." The remaining two-thirds who did promote relied mostly on price discounts, weekly specials, and extra effort on telephone sales as promotional tools. No wholesaler, moreover, thought branding fresh fish would increase sales.

The delivery time to restaurants and institutions ranged from four to 48 hours. For delivery to other wholesalers or retailers, the delivery time varied from four hours to seven days. Several chain store warehouses mentioned the seven day delivery time due to their policy of shipping trailer loads of merchandise weekly to their retail outlets. About 85 per cent of the wholesalers who responded to this question, however, said they delivered within 24 hours of receiving an order. Many of these wholesalers covered a 90-mile trading area while two served the entire state.

Among the problems mentioned by wholesalers handling fresh seafood were the high cost of direct labor in processing whole fish, shortage of labor, poor quality of fish, and an inadequate supply of popular species. Related to the latter problem, wholesalers were shown a list of 14 under-utilized species and asked if they recognized each specie; whether or not they could sell it profitably and their reasons for not offering these species. Less than half of the people interviewed were familiar with a majority of the species listed. Lack of consumer demand was the reason generally given for not handling these species. The wholesalers

would offer a specie if profitable, but they were unwilling to shoulder any responsibility for popularizing a specie, thereby making it profitable.

The information gleaned from the wholesalers shows a preference among a majority of wholesalers for handling frozen seafood in contrast to fresh seafood; an upward trend in their sales of frozen seafood compared to the relative stability or decline in sales of fresh seafood; a delivery service that already meets the 24 hour delivery criterion in most situations; a short supply of the most popular fresh seafood species; a promotional sales program aimed at retailers, restaurants, and institutional buyers rather than household consumers; and a reluctance to assist in popularizing underutilized species to alleviate the pressure on the accepted fresh seafood species. Under these circumstances, the proposal to establish an information network for fresh seafood with a 24 hour order/delivery time is suspect since other issues relating to fresh seafood are more critical and many wholesalers report they strive to fulfill orders in 24 hours.

SURVEY OF SELECTED RETAIL FOOD STORES HANDLING FISH

Concurrent with the wholesalers' survey, interviews were conducted with selected retailers. All general line and specialty line retail grocers in the two counties were con-

tacted initially by telephone to sort out those who did not handle fresh, frozen, or canned fish. A random sample of non-chain retailers was then selected from the list of retailers who carried some form of fish. Chain store outlets (centrally owned and centrally directed units) were selected in the same manner; but fewer units were interviewed because there were only minor differences in policies, attitudes, and operating methods among the retail outlets of respective chains. A total of 115 retailers were selected in this manner. Usable replies to the pretested questionnaire were received from 110 establishments. The replies were tabulated by means of a Cobal program.

The retailers handling fish were categorized as either (a) general line grocers or (b) specialty fish and/or meat markets with fish. In each category, the stores were further identified as independents (nonaffiliated, individually owned and operated but members of a retailers or wholesalers' sponsored voluntary group); and chains (centrally owned and centrally managed). All twelve specialty fish or meat markets surveyed were independents. Forty-eight of the 98 general line food stores were independents; 33 were affiliated stores; and 17 were chain stores.

An analysis of the type of fish handled showed canned fish was carried by 98 per cent of the general line retailers and 17 per cent of the specialty stores. The general line grocers were also more likely to offer various forms of

frozen rather than fresh fish. Specialty line stores emphasized fresh fish although several combination meat and fish markets distributed frozen instead of fresh fish. A composite profile of the sales of all general line retailers pointed up the fact nearly 54 per cent of a typical stores full line of fish sales would be canned fish, 39 per cent frozen fish, and seven per cent fresh fish.

When queried about sources of supply, it became evident that few retailers purchased the same form of fish from more than one wholesale source. Chain stores secured their canned and frozen fish from their company's warehouse. Some chain warehouses also supplied fresh fish while others instructed their store managers who want to handled fresh fish to obtain it from local independent wholesalers. Similar to the chain stores, nonchain retailers usually obtained both canned and frozen fish from the same source whereas fresh fish was purchased from different suppliers in the event they handle fresh fish. All but two of the different wholesale sources mentioned were within 70 miles of the retailers' establishments.

More retailers reported declines in sales of fresh, frozen, and canned fish than those who reported there was either no change or an increase in sales over the period 1966-1971. More of the larger general line retailers with total annual sales of \$500,000 and up, however, reported increases in

sales of frozen and/or canned fish than those who said there was no change or sales had declined. Those with increased sales attributed the rise primarily to an expansion of their store's offering (especially frozen fish); the lower price of frozen and canned fish compared to meat; and more "weight watchers." Those whose sales had declined mentioned "pollution scares" most often. The next most frequently given reasons were "higher prices" of fresh, frozen and canned fish, as well as the "Pope's dietary edict."

Overall, there was a strong proclivity for frozen fish in contrast to fresh fish among the retailers. Retailers who reported they had no preference were either the larger stores handling both fresh and frozen fish or very small stores offering canned fish only. Surprisingly, 60 per cent of the specialty markets were either indifferent or preferred handling frozen fish. Those who preferred fresh fish did so because they thought customers preferred the taste and quality of fresh fish, or it was more profitable than frozen fish. Most frequently mentioned by retailers preferring frozen fish were "easier to handle in store," "no facilities in store for fresh fish," "less spoilage or waste," "no odor," "dependable supply," "more profitable," "customers prefer frozen," "cheaper than fresh," "better quality product than fresh," and "people want convenience." Very few retailers believed additional branding would aid in promoting sales except perhaps for fresh fish. Advertising as a promotional tool was related to

size of store. The larger the store the more likely it was to advertise fish, especially frozen or canned fish in contrast to fresh fish. In-store promotion also increased with size of store and emphasized frozen or canned fish over fresh fish.

Retailers offering fresh fish procured it by contacting their supplier whenever they needed fresh fish, or they placed their orders with salesmen who called regularly. Twenty-six retailers indicated they received their orders in 24 hours while 16 said it took longer. Most of those with longer delivery time, however, were chain store units ordering from their company warehouses. Interestingly, few retailers were interested in daily delivery since they typically stocked fresh fish for weekend (Thursday-Saturday) sales.

When asked about their reaction to 24 hour delivery time, 60 per cent replied they already had it, while an additional 24 per cent felt the service was "not worth the trouble" or "don't need it." Four out of five retailers with fresh fish further reported they thought their customers would be indifferent to a 24 hour order/delivery system.

Like the wholesalers, the 42 retailers handling fresh fish were also interrogated about underutilized species. Their reaction paralleled that of the wholesalers. That is to say, they did not and would not handle these species because there was "no demand."

If the reader were to reverse the titles of the two monographs dealing with the analyses of the wholesalers' and retailers' surveys, he would find few differences. The inferences summarized in the last paragraph of the wholesalers' survey above also represent the attitudes of the retailers and support the observation that there are more critical issues concerning the harvesting, processing, transporting and marketing of fish than the establishment of a 24 hour order/delivery system.

FISH AS A HOUSEHOLD MENU ITEM--ATTITUDES OF CONSUMERS

Implicit in the 24 hour order/delivery proposal is the assumption that demand for fish will increase when the supply is augmented by adoption of the system. Exploratory research of consumer attitudes and demographic characteristics, consequently, was undertaken to identify regular from irregular users and determine what factors influenced their demand.

Questionnaires were mailed to over 4,500 households randomly selected by a computer program in the two county area. Additional mailings and/or telephone calls were made to those who did not respond to the initial mailing. By the time the survey was completed, 1,730 usable replies (40.1 per cent) were received. Statistical tests of the respondents' household size, income, and race with census data show no significant differences at the .05 level.

The timing of the study was unfortunate because the so-called "mercury scare" caused some uncertainty as to whether or not there would be an adverse effect on respondents. Although the questionnaire study was already launched, a limited study of the effect of the pollution publicity was made of two areas in Cleveland that varied as to income, education, and race.⁸ It was found that, in both groups, the regular users of seafoods tended to ignore the implications of this situation and the non-regular users to give it, among others, as a reason for not buying and eating fish.

The questionnaire was divided into three parts. The first part contained 24 attitudinal characteristics to determine the respondents' attitudes toward fresh, frozen unprepared, and frozen prepared finfish, and shellfish as well as canned fish. Demographic characteristics were covered in the second part of the questionnaire. Finally, respondents were asked how often they consumed each type of fish at home and how they purchased fish. Even though the survey dealt with various types of fin, shell and canned fish, only the findings for fresh finfish are discussed here due to the space limitations.

⁸Kelly, J. Steven, Attitudes about Water Pollution and Fish Consumption, Working Paper, Kent, Ohio: Center for Business and Economic Research, Kent State University, 1972.

The attitudinal and demographic variables were selected by means of a literature survey, interviews, and pretesting of several versions of the questionnaire. The semantic differential technique was utilized to evaluate attitudes. Respondents were asked to judge concepts against a series of bi-polar adjectives on a seven point scale.

Both univariate and multivariate techniques were used to analyze the data. With univariate analyses, consumer profiles were obtained while multivariate analyses were employed to classify respondents as either regular or irregular users of each type of fish. Regular users were defined as respondents using that particular type of fish at home once a month or more. Irregular users consumed a given type of fish less than once a month at home.

The univariate method is a simple one-way analysis of variance between the group means (averages) for regular versus irregular users which identifies the statistically different variables between the groups at a designated level of significance (.05 in these runs). The MANOVA computer program was utilized for univariate analyses.

Among the 1,730 respondents, 652 (37.8 per cent) were regular users of fresh finfish while 1,078 (62.2 per cent) were irregular users. The attitudinal profiles of the regular versus irregular users of fresh finfish showed that regular users view fresh finfish more favorably than irregular

users. Both groups, nonetheless, rated fresh finfish quite favorably on six variables. They agreed it is an excellent diet meal and tastes good. They further agreed it is nutritious, compares favorably with meat in nutrition, is easy to cook, and is safe to eat. Twelve attitudinal variables were rated somewhat favorably to indifferently by regular users and indifferently by irregular users. Neither group believes, for example, that fresh finfish was especially difficult to prepare, repugnant in appearance, or poor in quality. Similarly, regular users considered fresh finfish a Guest meal and a dinner treat whereas irregular users were indifferent. Fresh fish, moreover, was not rated as substantially inferior to meat in ease of cooking, preparation, quality, taste, safety, or cost by regular users although irregular users were inclined to be on the higher end of the indifference scale on these factors. Lastly, irregular users rated the aroma and availability of fresh finfish unfavorably while both groups agreed quite strongly on the unfavorable characteristics of perishability and perishability in comparison to meat.

Turning to the demographic profiles, regular users of fresh finfish were older, had fewer but older children, smaller households, less education, and lower incomes than irregular users. The group also included a higher proportion of Jews, more blacks, and fewer whites than the irregular user group.

Attitudinal and demographic variables were further analyzed by means of the BMD0 7M Stepwise Discriminant Analysis Program to classify the respondents as either regular or irregular users of each type of fish. The 652 regular users were randomly sorted into two equal size groups--an analysis sample (326) and a validation sample (326). Likewise, the irregular users were sorted into an analysis sample (539) and a validation sample (539). The discriminant (classification) functions were first derived with the analysis samples and then re-run with the validation sample data to test their predictive efficacy. The predictive efficiency of each discriminant function was tested by comparing the proportion of respondents correctly classified against what could be expected by random proportional guessing.

The best combination of variables for classification of respondents as either regular or irregular users included two demographic and eight attitudinal variables. The demographic variables were "age of housewife" and "white or not white." They ranked first and second respectively in importance in the discriminant. The eight attitudinal variables in sequence of relative importance were: taste, appearance, guest meal, ease of preparation compared to various meals, availability, taste compared to meats, diet meal, and safety to eat compared to meats. The proportion of respondents correctly classified ("hits") was 73.6 per cent in the analysis sample and 71.8 per cent in the validation sample. Compared to

53.0 per cent correct classifications expected by random proportional guessing, both of these classification percentages were significant at the .01 level.

These data show both regular and irregular users agreed that fresh finfish was not readily available. Rather than push for a sophisticated order/delivery system, perhaps the fisheries processors and wholesalers should direct their efforts to getting more retailers to handle fresh fish regularly. Interestingly, neither group thought fresh fish was especially hazardous to eat or outrageously priced. One may also infer from these data that the largest household market for fresh finfish was yet untapped if the younger, white families who were predominantly irregular users were viewed as potential regular consumers.

MARKET SEGMENTATION BY AUTOMATIC INTERACTION DETECTOR (AID) ANALYSIS OF HOUSEHOLD CONSUMERS

The material in this monograph supplemented the analyses in the previous monograph, Fish as a Household Menu Item. The multivariate program (AID - Automatic Interaction Detector) was utilized in identifying homogeneous subgroups in terms of demographic and attitudinal variables related to purchase behavior. The major objective of this program was to identify different segments (groups) in the consumer market associated with various types of fish. Through the use of the AID

program, discrimination between group purchase rate averages was maximized since the sample was partitioned into a series of subgroups through a sequence of binary splits.

Each AID run led to four output documents. The first was an "AID Tree" which indicated the series of binary splits on the variables when going from the original sample to each final subgroup. The second document gave the number of market segments (subgroups) and the characteristics of each segment. The third output document was the predictor rank (index) that represents the increase or decrease in probability of a respondent in a market segment (subgroup) being a regular user. For example, if a market segment represented ten per cent of the original sample but contained 20 per cent of the regular users, the probability index was 2.00. Finally, the split data table was a document that gave the key competing variables on which the split might have occurred and the degree of competition of these variables on each split.

A summary of the AID runs for fresh finfish showed that the attitudinal variables account for more variation than the demographic variables. In terms of attitudinal variables, for example, nine final subgroups or market segments were identified for fresh finfish. Only the two largest subgroups are presented here. The largest subgroup contained 20.6 per cent of the original sample and merely 2.7 per cent of the

regular users. This segment stopped splitting on the first (terminated) variable "taste" which they so strongly disliked that the odds were six to one against their being among the regular users. The second largest subgroup contained 17.2 per cent of the original sample and 34.6 per cent of the regular users. The people in this subgroup, consequently, were twice as likely to be among the regular users. These respondents rated the taste, quality, appearance, and taste of fresh finfish compared to meat very good.

The AID runs on the demographic variables produced four subgroups. The largest subgroup represented 62 per cent of the respondents and contained 63.8 per cent of the regular users for a probability index of 1.03. These respondents were white, over 35 years of age, and non-Jewish. The second largest segment represented 25.4 per cent of the sample and 14.3 per cent of the regular fresh finfish consumers. The odds were two to one that they were not among the regular users. These respondents were white and under 35 years of age. The third largest group split on the variable race, that is that they were black. Their likelihood of being among the regular users was two to one. The last market segment consisted of whites over 35 years of age, who were Jewish. Their probability of being among the regular users was 1.6 to 1.0.

A comparison of the AID results with that of the univar-

iate and discriminate analyses in the previous monograph showed they concur that the regular users of fresh finfish were more likely to be over 35 years of age and included proportionally more Jews and Negroes than the irregular users. In terms of total number of regular purchasers, the majority were white, non-Jewish and at least 35 years of age. Both studies, furthermore, indicated that taste was a very significant discriminating attitudinal variable. The studies also revealed that both regular and irregular users were very concerned about the "freshness" (not safety) of fresh finfish. An effective delivery system of the type proposed, consequently, would have merit if it truly provided "fresh" fish, thereby mitigating the consumer's fear of buying stale fish.

SURVEY OF INSTITUTIONAL USERS OF FISH

To round out the picture of the market for fish in the two counties, a mail questionnaire was sent to a sample of the institutional users - restaurants (divided into two groups--chain and independents), schools, hospitals, and caterers. Ninety-one usable replies were received. Chain restaurants and schools had similar buying patterns, tending primarily to use frozen prepared finfish while the other three tended to use various forms of both fresh and frozen fish.

Independent restaurants served the greatest number of

meals using fish as an appetizer or entree. Some of them specialized in fish menus while others offered a limited number of fish dishes daily. They also used a greater proportion of fresh as well as frozen shellfish.

The other groups who were concerned basically with standard-sized portions for large numbers used frozen prepared finfish with very little use of shellfish. Since many caterers apparently were supplying meals in plants, they, too, used frozen prepared finfish with a slightly greater use of shellfish for variety.

It was concluded that the institutional users, like wholesalers and retailers, do not present a very large market for fresh fish, either finfish or shellfish since their markets require a mass, portion-controlled item. Independent restaurants were an exception to this generalization as their clientele probably were among the most regular consumers of fresh fish and were willing to pay a higher price for such meals.

THE FRESHWATER FISH MARKETING CORPORATION OF CANADA

The Freshwater Fish Marketing Corporation of Canada came into being in 1969 to provide the fishermen of the prairie provinces with a more stable income; to regularize the flow of fish into the market, particularly the export market into the United States; and to provide a more powerful

bargaining organization than individual fishermen or processors in pricing their products. The implications of such an organization and its possibilities are summarized below.

Many fishermen have benefited from the creation of the Freshwater Fish Marketing Corporation. Perhaps the most significant benefit the fishermen have received from the current marketing system is a reduction in uncertainty. This includes uncertainty associated with prices and payment, ownership and physical possession, and demand. The Corporation's strategy of improving the orderliness of the marketing system has been a primary factor in facilitating this change. The fishermen have also benefited from the Corporation's development of markets for previously underutilized species. Prices paid the fishermen for these species have increased considerably as a result of advanced processing techniques that the Corporation has introduced. Also, average landed value per pound for total landings of all species has increased significantly since the creation of the Corporation. Finally, the fishermen now have a voice in the planning and decision-making activities of the fishery by means of the Advisory Committee.

Two areas are apparent where the fishermen are not better off than they were previously. Landed value per pound for the five primary species has not significantly increased since the creation of the Corporation, and the per cent of the export price received by the fishermen has not increased. The

available data fail to suggest why these benefits have not been forthcoming.

The implications of this study to the Canadian government, the Corporation, and its representatives are that the current system has made extraordinary progress in some areas, while other areas deserve more attention. By far, the greatest achievement of the Corporation has been in the area of orderly marketing. The second most important achievement of the Corporation has been in the Area of advanced processing technology. Payoffs from technological innovations have been observed in the development of new product forms, markets for previously underutilized species, and better coordination of supply with demand.

In the area of increasing returns to fishermen, the Corporation has only been moderately successful. Average landed value per pound for the combined landings of all species has increased significantly since the creation of the Corporation; however, the average landed value per pound for the five primary species has not increased. The findings of this study indicate improvement in this area is needed. Finally, the impact of the Corporation's efforts in the areas of promoting international markets for, and increasing trade in, fish is difficult to measure at this time due to decreases in commercial production which began in 1970; however, domestic sales and exports to countries other than the United States

have increased since the Corporation was created. It has been noted that domestic market opportunities deserve more attention.

Implications of this study to other countries, or national or regional groups contemplating collective marketing of fish are many. These findings are relevant to fishermen interested in organizing a cooperative; cooperatives contemplating the formation of a federation of cooperatives; and governments considering the feasibility of creating a fisheries monopoly. Common motivations to create such organizations include excessive price fluctuations, weakness of prices at the primary producer level, and/or insufficient storage and processing facilities. All of these factors were present in the Canadian system prior to the creation of the Freshwater Fish Marketing Corporation.

Perhaps the most significant implication of the findings of this study to any of the above groups is that an organized, orderly marketing system can be achieved through the establishment of an economic superstructure serving the individual economic units. The degree to which such a superstructure can affect organized, orderly marketing may well be a function of its economic power, derived from its size and magnitude of resources. For the purposes of this study, orderly marketing has been measured in terms of (a) stability of prices at each level in the system (b) coordination of

activities among participants, and (c) coordination of supply with demand.

Another benefit which can be realized from the establishment of a fishery superstructure, as has been demonstrated by the Freshwater Fish Marketing Corporation, is the ability to introduce advanced technological processes. In order for a marketing system to implement technological processes, new product forms can be developed. Underutilized species can become economically feasible both for human consumption and industrial use. Likewise, fish parts, considered by many to be waste, can be processed for further use. Other benefits which can be achieved through collective marketing include more economical use of facilities, and increased adaptability to the market through centralized decision-making and information networks.

EXTERNAL FACTORS AFFECTING THE INDUSTRY

Among the external factors over which even the Federal government may not have much control are the invasion by foreign fleets of what have been considered United States waters and their disregard of covenants governing fishing; the greater demand abroad as shown by prices received; and the diminishing stocks of fish throughout the world.

Foreign Fleets in United States Waters. With the development of better boats and gear, foreign fishing fleets have

taken a heavy toll of fish in American waters. Soviet fleets operating from factory ships have systematically gone after one specie and then another.⁹ By this method of operation, they concentrate their activity in an area until it is fished out and move on to another. Whether or not proper conservation methods are followed does not concern them. The Japanese, like the Russians, needing a source of protein for a huge population, similarly have acted contrary not only to agreements as to areas to be fished but also as to amount to be taken.

Coupled with the movements into traditionally United States waters by these countries' fleets and those of East Poland, Iceland, Spain, and others, has been greater efficiency by their fishermen. Few operate on an individual basis but operate as did the United States whaling expeditions in earlier periods. Other countries, particularly the Russians, operate factory ships that process, freeze, and store the fish brought to them by smaller vessels. Although two such operations in the United States were subsidized by the Federal government, one on each ocean, they did not appear to appeal to the United States fishermen and so were abandoned.¹⁰

⁹Alexander, Tom, "American Fishermen Are Missing the Boat," Fortune, September, 1973, p. 193.

¹⁰Op. cit., p. 196.

Jurisdictional Problems. As the world appears to shrink because of more rapid communications and transportation and as the need for ocean resources becomes more apparent with increased populations and the growth of developing nations, the necessity of determining the rights to specific ocean areas gains greater importance.

Not just fish, but minerals, petroleum, control of pollution, rights of passage, are subject to the question of sovereignty. The old three-mile limit hardly exists; many countries accepted a 12-mile limit at the first United Nations Law of the Sea Conference in 1958. Many of the small developing countries, especially with long coast lines, claimed and enforce a 200-mile jurisdiction.¹¹ To aid the domestic fleet, Senator Warren Magnuson of Washington and Representative Gerry Studds of Massachusetts have co-authored a bill in Congress to extend United States fishing water to 200 miles.¹² It is doubtful if such a bill will pass because of the problems it would make for tuna fishermen on the West coast and shrimpers in the Gulf of Mexico. At best, the Law of the Sea conferences provide forums that focus upon the

¹¹An up-to-date summary of the situation at the Third Conference now being held in Caracas, Venezuela, will be found in "Who gets the oceans' economic wealth?" Business Week, June 22, 1974, p. 60-65.

¹²"Failing Fleets," Time, June 3, 1974, p. 75.

issues that should be settled, but whose settlement probably will not be accepted by all 151 nations participating.

Greater Demand Abroad. Because of the greater need by many countries for protein-high foods, many exporters have found that the better fish such as the top-grade salmon steaks will bring a greater price and hence higher return if sold abroad. Many processors find this to be true also. Often the fish shipped fresh or quick-frozen overseas may return to this country in smoked or canned form. Although the per capita consumption in the United States is now 12.6 pounds, it represents approximately no more than one-fourth of the "meat" consumption here while in many countries fish is about 80 per cent of the meat intake.

Diminishing Stocks. Already certain specie are endangered. In spite of the protocol signed by whaling nations that provided a period in which whales would not be taken so as to make possible a future supply of meat and oil, it has been disregarded by some nations, particularly Japan, on the basis that the need transcends any treaty obligation. Other specie such as cod, haddock, and other finfish approach the limits of natural resupply possibilities.

Summary. All these facts above have a bearing on the United States market for fish. All of them are negative factors, diminishing the possible place of fish in the national diet and making a controlled system of marketing more

desirable. Whether or not this need will be recognized so as to change the structure of the industry remains to be seen.

CONCLUSIONS

Based upon the findings of the research and particularly in light of the chaotic world fisheries industry, the conclusions following may be drawn:

1. The demand among household consumers for fresh fish does not apparently warrant a sophisticated (and more costly) distribution system.

2. Considering the present chaotic situation in the fisheries industry brought about by government controls and foreign exploitation of coastal waters, it is unlikely that consistent supplies of high quality fresh seafood may be obtained. Since this condition cannot be met, it is doubtful that, even if the demand were increased for a time, it would be a sustained increase.

3. The supply of fresh fish will not be increased even if there were an additional demand because of other factors which will offset such a supply-demand shift (see Number 4 below).

4. Wholesalers and retailers would rather handle frozen fish because of ease in handling, less deterioration, and a more consistent supply; hence few, if any, would be willing

to promote the sale of fresh fish.

5. Adequate physical facilities are available to provide the system proposed. Since many retailers already have 24-hour delivery service, it would appear that delivery systems are adequate at present.

6. Although lower costs of processing, physical handling, and transportation might be obtained by such a system, there would be higher cost to provide the communications network and order-filling process. No centralized agency appears ready to maintain and control such a system and it is doubtful that the Federal government, if it should establish it experimentally, would find it being used by the middlemen.

To answer the question as to the proposed system's feasibility in terms of the findings above and the overall fisheries study made through this research, it must be concluded that, considering the domestic situation, such a system, although technologically possible, should not be established at this time because of the nature of the product, which does not provide a stable, constant source; the structure of the industry with thousands of fishermen and vessels of extreme differences in size and gear; and the indifference, at least, of Midwestern distributors and perhaps even of consumers.

ALTERNATIVES

What are the possible alternatives in the future which might change the answer to the question of feasibility of such a system? These might include subsidization of the fishing activity by the Federal government; the closer integration of the channel members through cooperative associations; or standardization of the product and the acceptance of under-utilized specie.

Federal Subsidization. As in the case of the farmers in the period beginning with the economic depression of 1929-1933, fishermen might be given an assured price by a Federal agency for the catch. This price would be one that should be covered by the final market price. Advances of payment on this basis would either be repaid by the fishermen when the market price obtained is higher or by the Federal government taking the fish and selling it at a lower price and subsidizing the loss on the catch. Because of the nature of the product and the risk of spoilage for fresh fish, nearly all fish in the market would be frozen or canned. It is doubtful if this program would be readily accepted by the independent fishermen. An experiment somewhat along this line has been attempted by Canada for the fishermen in the

non-maritime provinces.¹³ Only in existence for three years and without Crown subsidies, further study of it at a later date might be desirable.

Integration of Channel Members. The integration of channel members may take place through the organization of cooperative associations or by ownership being obtained by purchase of fleets or distributors. Although not successfully documented, there appears to be a trend toward establishing fisheries cooperatives on a state-wide basis, rather than in terms of specie. Processors may reach back and purchase fleets or may integrate forward in the channel by buying or being bought by distributor groups.

Such integration, particularly by the fishermen themselves, may be the way of the future. Greater attention might be paid to this alternative for the fisheries industry.

Standardization of Product. Since one of the goals for the future is more efficient use of protein sources in the diet and since the demand for fresh fish, at least in the Midwest, is not great, perhaps one alternative course of action is for the industry to devote itself primarily to the

¹³Lamb, Charles, and Donald F. Mulvihill, op. cit.

production of fish blocks that in turn may be used in portion-controlled meals. Whether or not they be sold in institutional meals, "fish and chip" houses, or a convenience prepared meals in the home, they would make possible the use of underutilized specie and provide more protein totally, perhaps in not the most desired form for some consumers. Such an alternative already is used by the Russians, Japanese, and other protein-poor nations. Although not in keeping with some characteristics of the United States marketing process, the future problems of matching supply with the increasing food demand may force its acceptance.

Only three alternative courses of action have been presented. These may not be the only ones that might be practiced in the future. It might also be that the future will see a more organized fisheries industry in which the proposed marketing communications and physical distribution system could be used profitably.

