SURVEY OF THE UNITED STATES SHRIMP INDUSTRY

VOLUME II

SPECIAL SCIENTIFIC REPORT–FISHERIES No. 308

UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE

EXPLANATORY NOTE

The series embodies results of investigations, usually of restricted scope, intended to aid or direct management or utilization practices and as guides for administrative or legislative action. It is issued in limited quantities for official use of Federal, State or cooperating agencies and in processed form for economy and to avoid delay in publication.

United States Department of the Interior, Fred A. Seaton, Secretary
Fish and Wildlife Service, Arnie J. Suomela, Commissioner

SURVEY OF THE UNITED STATES SHRIMP INDUSTRY

VOLUME II

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ABSTRACT

This report published in two volumes provides a comprehensive examination of the shrimping grounds, vessel construction, fishing operations, fishing costs, processing plant efficiency, processing costs, trends in distribution, packaging, storing, shipping, per capita consumption, prices wholesaling, retailing, merchandising, and consumer preferences.

A chapter on conclusions and recommendations finds that the shrimp industry's welfare can be safeguarded best (1) by increasing the efficiency of operations at all levels and thus effecting cost savings in shrimp production, processing and distribution and (2) by stabilizing markets. Specific suggestions to improve current practices are made throughout. For example, the chapter on processing in Volume I contains the results of engineering surveys which provide plans for model layouts for freezing and breading plants and canneries. An economic analysis is made of the problems of marketing and price stability.

The project was financed with funds made available by the Saltonstall-Kennedy Act, approved July 1, 1954 (68 Stat. 376).

ACKNOWLEDGEMENTS

Survey of the United States Shrimp Industry was compiled by staff members of the Branch of Economics, Bureau of Commercial Fisheries from sources of information and technical advice available, for the most part, from within the Bureau. The results of special research projects undertaken under contract arrangements with private firms, universities, and other government agencies to supplement these sources of information are incorporated in this report.

The survey originated under the direction and supervision of the late Dr. Richard A. Kahn, Chief, Economics and Cooperative Marketing Section, Walter H. Stolting, Assistant Chief, and Otto Rauchschwalbe, Economist.

The economic analysis and the text are largely the work of Robert Hamlisch, Economist. The report was prepared for publication under the direction of Alton T. Murray, Economist. Charles A. Carter, Commodity Analyst, provided the references to the historical development of shrimp fishing and processing industries. Donald S. FitzGibbon prepared the graphs and charts; Evelyn H. Kramer and Saralyn V. Wolff assisted in the preparation of statistical tables.

Stewart Springer, Chief, Branch of Exploratory Fishing and Gear Research, and James B. Higman of that Branch gave technical advice for the development of the chapters on fishing vessel construction and fishing operations. Charles Butler, Chief, Branch of Technology; William H. Dumont, Assistant Chief, Branch of Statistics; and Stacey C. Denham, Fishery Marketing Specialist, were consulted on technical subjects.

The A. C. Nielsen Company contracted for a sub-project on distribution, merchandising and consumer preference; the University of Miami, at Coral Gables, Florida, for primary marketing; Harwell, Knowles and Associates, for vessel efficiency; the Federal Trade Commission, for fishing vessel and processing plant costs; First Research Corporation of Florida, for processing plant efficiency and for time and motion studies of fishing operations. Lawrence W. Strasburger, Consultant, reviewed the manuscript, particularly the chapters concerned with processing.

All figures were prepared by United States Fish and Wildlife Service personnel, except those specifically credited.

PREFACE

Discovery of new fishing grounds, expanding markets, and the increase in the size of the fleet have contributed to the dramatic growth of the shrimp industry within the past decade. Currently, the shrimp fishery is the most important in the United States measured by the value of landings. Moreover, the shrimp processing industries and distributive channels have also greatly expanded their facilities and the volume and variety of shrimp products reaching the national market during the past decade.

The period of growth and expansion of the shrimp industry was marked by occasional setbacks and periods of marketing doldrums. It was during these periods that some of the basic problems of this industry were revealed as pitfalls to be avoided in the future. Fortunately, none of these particular basic problems, which were noted during the period of field work and analysis on this study, appear insoluble. Rather, the shrimp industry's general welfare is related mainly to the solutions of a lot of little problems--all of them concerned with increasing the efficiency of operations at all levels and thus effecting cost savings in shrimp production, processing, and distribution.

Survey of the United States Shrimp Industry examines all phases of the fishery, vessel construction, operations and gear used in fishing, production costs, the physical layout and efficiency of processing plants, packaging, distribution, and marketing. Every effort has been made throughout the survey to provide specific suggestions and recommendations for improving current practices.

Volume I of this report published as Special Scientific Report - Fisheries No. 277 contains the first five chapters which deal with production and processing.

This volume contains the last four chapters, three of which deal with marketing. The last chapter contains a summary of conclusions and recommendations addressed to a dynamic industry in an ever-changing economy. A subject index to both volumes is appended.

Survey of the Shrimp Fisheries of Central and South America and Foreign Shrimp Fisheries other than Central and South America referred to in the text have been published as Special Scientific Report - Fisheries No. 235 and No. 254, respectively.

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CHAPTER VI

MARKETING

ABSTRACT

THE BULK OF THE SHRIMP CONSUMED FRESH IS PRODUCED BY FISHERMEN OPERATING FROM SOUTH ATLANTIC AND WEST COAST FLORIDA PORTS. FRESH SHRIMP MAY GO DIRECTLY FROM THE RAW SHRIMP PLANT TO THE WHOLESALER IN THE CONSUMER MARKET OR EVEN TO THE LOCAL RETAILER IN THE LANDING PORT. MORE OFTEN A PORT WHOLESALER, WHO HAS ASSEMBLED FRESH SHRIMP FROM A NUMBER OF SHRIMP PLANTS, CHANNELS THE SHRIMP INTO THE CONSUMER MARKET. FISHERMEN'S COOPERATIVES FUNCTION IN THIS MANNER. SHIPMENTS OF FRESH SHRIMP ARE DESTINED PRIMARILY FOR NEW YORK CITY AND SOME OF THE POPULATION CENTERS NEAR THE TRUCK ROUTES RADIATING FROM THE LANDING PORTS. SHIPMENT IS MADE ON A COMMISSION BASIS OR ON DIRECT SALE TO A BUYER.

THE DISTRIBUTION CHANNELS FOR FROZEN SHRIMP ARE SIMILAR TO THOSE FOR FRESH SHRIMP BUT LARGER QUANTITIES OF FROZEN SHRIMP ARE HANDLED BY WHOLESALE FOOD BROKERS THAN ARE SOLD DIRECTLY BY TITLE-HOLDING WHOLESALERS OR ON COMMISSION. LARGE GROCERY STORE OR RESTAURANT CHAINS OFTEN BY-PASS FOOD BROKERS AND NEGOTIATE DIRECTLY WITH SHRIMP PROCESSORS OR WHOLESALERS. THE QUANTITY OF FROZEN SHRIMP HANDLED IS GREATER THAN THAT FOR ANY OTHER SHRIMP PRODUCT.

CANNED SHRIMP IS DISTRIBUTED IN THE SAME MANNER AS OTHER CANNED PRODUCTS, I.E., THROUGH MIDDLEMEN SUPPLYING THE RETAIL GROCERY TRADE: SECONDARY WHOLESALERS, BROKERS, AND CHAIN ORGANIZATIONS.

THE MARKETING PROCESS FOR SHRIMP PRODUCTS IS CHARACTERIZED BY THE ABSENCE, IN MANY INSTANCES, OF WRITTEN AGREEMENTS BETWEEN BUYERS AND SELLERS. THIS APPLIES TO SALES AT THE FISHERMAN'S LEVEL AS WELL AS TO THE SALES TRANSACTED BY SHRIMP PLANTS.

QUESTIONNAIRE INTERVIEWS OF SECONDARY WHOLESALERS AND RETAILERS OF SHRIMP PRODUCTS AS WELL AS AN AUDIT OF RETAIL SALES AND INVENTORIES AND A SHRIMP MERCHANDISING EXPERIMENT (MADE FOR THE PURPOSE OF STUDYING THE SALE OF PRODUCTS AT RETAIL UNDER SPECIALLY CONTROLLED MARKETING CONDITIONS) HAVE PROVIDED INFORMATION ON SECONDARY WHOLESALE AND RETAIL DISTRIBUTION PRACTICES AND PROBLEMS.

IN GENERAL, SECONDARY WHOLESALERS INTERVIEWED IN THE COURSE OF THE SURVEY WERE OPTIMISTIC ABOUT THE TRADE'S ABILITY TO MAINTAIN A FLOURISHING MARKET IN SHRIMP PRODUCTS. IN CASE OF A SLUMP IN DEMAND, THE QUESTIONNAIRE RESPONDENTS HELD OUT THE GREATEST HOPE FOR THE FOLLOWING DEVICES FOR STIMULATING SALES: INTRODUCTION OF NEW PRODUCTS, BETTER PACKAGING, BETTER GRADING OF SIZE AND QUALITY OF PRODUCTS, CONSUMER ADVERTISING, AND COOPERATIVE ACTIVITIES BETWEEN WHOLESALERS AND RETAILERS.

THE DISTRIBUTION, SALES, INVENTORY, AND RETAIL MARGIN STATISTICS COLLECTED IN THE STORE AUDIT PHASE OF THE SURVEY RELATE TO A TWO-MONTH PERIOD IN 1955. AS OF THE TIME OF THE SURVEY, THE SHRIMP PRODUCT MOST WIDELY DISTRIBUTED IN RETAIL STORES WAS CANNED SHRIMP. TOTAL SALES OF SHRIMP AND SHRIMP PRODUCTS, AS PROJECTED FROM THE SAMPLE OF STORES AUDITED, AMOUNTED TO 27.3 MILLION POUNDS VALUED AT $24,240,000 DURING THE MONTHS OF AUGUST AND SEPTEMBER 1955. RETAIL STORES SELLING SHRIMP HAD APPROXIMATELY 8 MILLION POUNDS OF SHRIMP PRODUCTS IN THEIR INVENTORIES ON OCTOBER 1, 1955.

THE MERCHANDISING EXPERIMENT CONDUCTED AS A SEPARATE PHASE OF THE SURVEY FURNISHED PROOF THAT MORE ADEQUATE STOCKING AS WELL AS THE USE OF ADDITIONAL DISPLAY AND PROMOTIONAL MATERIAL ARE EFFECTIVE MEANS OF BOOSTING SALES OF SHRIMP PRODUCTS IN RETAIL ESTABLISHMENTS.

TRENDS IN DISTRIBUTION

Originally shrimp were an article of local consumption. Because of their perishable nature, they were consumed near the place of landing. When improvements in transportation and refrigeration made it possible to ship shrimp to inland locations, the widely dispersed geographic market pattern became more centralized. For approximately the past 20 years New York and Chicago have acted as the main price-registering centers of the shrimp market. New Orleans with its French Market for fresh shrimp has lost in importance during the same time. In recent years, the wholesale price quotations in the New York and Chicago markets have been reflected in the prices quoted in other markets and in the producing coastal centers.

Recently a new alignment of market forces has appeared. This alignment eventually may imperil the market role of New York and Chicago. Since today the large processing wholesaler, the importers of shrimp, and the regional wholesalers are in daily telephone communication with each other and with their local buyers, the price-making process is again becoming more decentralized. Counteracting this trend is the declining number of buyers. The fact that the wholesale trade is dominated by fewer and economically stronger buyers tends to eliminate some of the geographic price differentials. Still, even within the fresh or the frozen group, price variations exist because of such factors as differences in regional labor, transportation costs and fluctuations of supply. The increase in freezings has encouraged standardization of product and, thus, may bring about greater stability of prices.

The transformation of shrimp from an item of specialized regional consumption to a nationally distributed commodity has forced the fisherman to adapt his catch to the specific requirements of the market he serves. These requirements relate to grades, quality, and marketing terms specified by the buyer. As a result, the fisherman, in some instances, has taken over some of the functions not directly related to fish production, e.g., the heading, washing, storing, transporting, and primary wholesaling of shrimp. In fact, the fisherman now and then has gone even farther and branched out into processing.

Simultaneously, the demand of the market for a steady year-round supply has driven many wholesalers and processors to seek closer control over production. For this reason, they have frequently acquired boat operations of their own or tried to gain control over catch in some other manner.

In some areas the intermediary between producer and consumer is a combination wholesaler-processor-buying agent. Through his ability to store the product for longer periods of time and to transport it over wide areas, this intermediary has achieved a high degree of control over the market. This development has encouraged the fishermen to defend their own position in the market by forming cooperatives which take over some phases of processing or wholesaling operations or both, or seek closer ties with local wholesalers.

While at one time the boat owner entrusted nearly all of the marketing functions to the shrimp plant, he finds himself forced now to take an interest in the market processes, to keep himself informed about prices, and to gear the production process to the qualitative and quantitative demands of the market.

MARKET CHANNELS

General Considerations

From the boat to the consumer's table, shrimp goes through one of four marketing channels.

More shrimp probably goes from the shoreside plant directly to the processor and from there to the wholesaler who supplies the retail trade than through any other channel. In this channel, the shoreside plant, the processor and the wholesaler may all be separate and distinct agents, or any two, or perhaps all three of them, may be integrated into one operation.

Another important market channel interposes a wholesaler between the shoreside shrimp plant and the processor in the distribution chain. This wholesaler functions primarily as an assembler. His operation may be separate and distinct or it may be combined with those of the other agents in the distribution chain.

A third and more direct channel is used in the distribution of fresh shrimp. Fresh shrimp may go directly from the shoreside plant to the wholesaler in the consumer market or even to the local retailer in the landing port.

More often fresh shrimp are assembled from several shrimp plants by a wholesaler in the production area. The port wholesaler channels the shrimp into the consumer market. Fishermen's cooperatives often function in this manner.

The physical movement of the goods from one handler to another may or may not be accompanied by a title transfer. In certain instances, the boat owner retains title to the shrimp through to the consumer market. This may be the case when the shrimp are sold directly into the fresh market and the raw shrimp plant acts merely in a service capacity or when a processor-boat owner packs under his own name. If the shrimp plant performs the assembling function, using the services of a public freezer for storage, it may take title from the fisherman and retain it through to the retailer. The same may be true of a canner, freezer or breader who may hold title from the time he receives his supply of raw shrimp until his product is distributed in the consumer market.

Essentially, the choice of the channel through which the shrimp flow is influenced by the scale of operations of the agents in the distribution chain, their geographic location, and the form in which the shrimp are marketed. As a handler's scale of operations increases, so does his ability to integrate certain marketing functions with his business. Similarly, the distance between the producing port and the consumer market determines the need for intermediary assemblers and sales organizations. The relative perishability of the product is the third factor bearing on the choice of a market channel. The greater the danger of spoilage, the more direct is the channel that has to be chosen.

Fresh Shrimp

Most of the shrimp marketed fresh in the United States originate in the States of Florida, Georgia, North Carolina, and South Carolina. The bulk of the fresh shrimp is destined for New York City or for one of the large cities situated on or near the truck route from

the point of origin. Chicago no longer has a fresh shrimp trading market and practically all of the shrimp now shipped to this city is frozen. 1/

What is perhaps the simplest form of marketing structure in the industry may be found along the South Atlantic seaboard, especially in North and South Carolina and Georgia. It is estimated that 70 percent of the shrimp landed in these States goes to the fresh shrimp markets in the northeastern part of this country; most of the remainder is sold to processors located in Georgia.

Fresh shrimp shipments are usually made on a commission basis or on direct sale to a buyer. From the standpoint of the person holding title to the shrimp, an arrangement under which the shrimp are sold prior to shipment or while enroute to the consumer market is preferred. The latter occurs when a commission shipment to New York is sold in transit by the shipper to a buyer in Philadelphia or some other stopover. For this purpose truckers are often instructed to stop at a telegraph office in a designated city for new delivery orders.

There are several reasons why commission shipments are not very popular with the owner of the shrimp. If the shipment arrives when the market is oversupplied, he must either sell at a distress price or have the unsold shrimp frozen and stored until the market situation improves. In addition to the increased costs entailed by the latter and the market risk, potential losses due to quality deterioration have to be considered; the danger of spoilage is greater the longer the interval between the time the shrimp were caught and the time they are frozen.

Rather than face the problems connected with the consignment-type of sale, the boat owner may choose to deal with an assembling wholesaler. These wholesalers can be found in nearly every section of the South Atlantic Area.

Prior to the establishment of local cooperatives, sales by fishermen to fresh-market wholesalers were more frequent. Most wholesalers now serving the fresh market also deal in other fish products and often shrimp are only a minor line with them.

1/ Generally, the Chicago wholesale market deals in larger-sized shrimp, arriving there mostly from Texas, Louisiana, and Mexico. Frozen shrimp arrivals at the Chicago Market in 1957 were 14,318,600 pounds with only 10,600 pounds of fresh shrimp being received. In contrast, the New York City Salt Water Market arrivals for 1957 were 6,193,100 pounds of fresh and 7,263,400 pounds of frozen shrimp.

At present, the middlemen in the fresh shrimp markets in the producing area are local wholesalers or cooperatives. Out-of-town buyers still appear in the local landing places, especially whenever shrimp are scarce. Some wholesalers have agreements with fishermen providing that they will take the entire catch at current market prices, but only in rare instances are these agreements exclusive in character.

Frozen Shrimp

In areas where the frozen product predominates, shrimp are unloaded from the boat at the shrimp plant where they are headed, washed, and often graded, and trucked from there to the freezer. Most coastal freezers have limited storage capacity. As soon as practicable the shrimp are moved to a cold storage warehouse located near the consumer market.

Where the shrimp are marketed in breaded form, the freezing operation is frequently of an auxiliary nature. The breaded shrimp are often stored in public cold storage facilities.

The distribution channels for frozen shrimp are similar to those for fresh shrimp. In contrast to fresh shrimp, however, larger quantities of frozen shrimp are handled by wholesale food brokers than are sold directly by title-holding wholesalers or on commission.

Large grocery store or restaurant chains often by-pass food brokers and negotiate directly with shrimp processors or wholesalers. The volume of business handled by these chains warrants buying in this manner.

Canned Shrimp

Shrimp used in canning originate either with independent or cannery-owned boats. In the former case, the shrimp frequently are sold by the receiving plant to an assembling wholesaler or directly to the cannery.

Canned shrimp, as a rule, are distributed in the same manner as other canned products are distributed, i.e., through the middlemen supplying the retail grocery trade, secondary wholesalers, brokers, and chain organizations.

Canneries buy all grades of shrimp. The lower counts of shrimp bring a better price when they are marketed fresh or frozen and ordinarily are not processed by the canneries.

Dried Shrimp and Shrimp Meal

The raw material for the shrimp drying platforms are sea bobs, grooved and white shrimp. After drying, the shrimp are packed in 50-pound boxes and 200-pound barrels for the wholesale trade. The most common wholesale package is the 50-pound box, although smaller packages are available to meet the demands of the local retail trade. Dried shrimp are packed for export trade in the same type of containers that are used for the domestic wholesale trade.

Sales of dried shrimp, confined for the most part to San Francisco, New York and other cities having a large population of Oriental descent, are transacted by specialty wholesale brokers under customary brokerage arrangements.

Dried shrimp are retailed in bulk form, usually in specialty stores located in the Oriental sections of large cities. About 400 dried shrimp are equivalent to one pound. A quarter of a pound is considered an average sale. In the Gulf States, near the point of production, dried shrimp are sold like potato chips in small cellophane bags.

Shrimp meal which is a by-product of the drying, and to some extent of the canning industry, has a very limited market and is usually sold locally as a feed mix, and at one time was also used as fertilizer.

MARKET AGENTS

Whether shrimp ultimately reach the retail market in fresh, canned, frozen, or breaded form, the key function near the beginning of the distribution chain is performed by the wholesaler who assembles the shrimp from a group of fresh shrimp plants. Individual fresh shrimp plants cannot, as a rule, produce enough shrimp to meet the demands of either a processor or a volume buyer, unless they themselves take over the function of assembling. The interposition of a middleman between raw shrimp plant and processor is not necessarily uneconomical; in the large scale handling of shrimp it may become a cost saving necessity.

In Texas ports, the dock-side plant often buys the shrimp from the boat owner and freezes them. Under these conditions, the product is stored by the establishment in its own name until it is disposed of. Public freezers and storage warehouses in this State operate in one of two ways. They either take the shrimp directly from the shrimp plant and perform all of the necessary operations including washing, grading, and packing in the consumer package; freezing, glazing

and storing; or they confine themselves to the storage of shrimp processed by others. In the latter instance, the freezers do not own the shrimp. Because of warehouse limitations, they often store for an individual customer only long enough to accumulate a full truckload. The customer must then either sell the product in the local market or ship it farther inland to cold storage warehouses.

Processing establishments specializing in freezing, breading or canning act in a variety of ways in the market process. Sometimes their buying organizations take over the assembling function in the coastal market. At other times they may branch out into wholesale distribution of their finished product.

The national wholesalers of processed shrimp are probably the most important single price-determining agents. Their position in the distributive mechanism is very favorable inasmuch as they are able to analyze consumer demand and supply simultaneously. Since they do not limit themselves to any particular locality in making their purchases, the prices quoted by them to suppliers may affect the market throughout the entire shrimp-producing area of the country. The ex-vessel price paid to the fishermen then becomes dependent upon the nationally-quoted buyers' price.

Occasionally, complaints to the effect that the market is rigged by individual buyers are encountered in the industry. On closer analysis these claims are not confirmed. Obviously, when a buyer's market develops, buyers will take advantage of the situation, just as obviously as individual sellers in times of a seller's market will try to sell to the highest bidder regardless of continuity and stability of trading relationships. Rarely, however, will a few individuals gain a position where they can control the price to their advantage.

In each area, according to generally held beliefs, there is a tendency for one segment or another of the industry to set the price for the local market. In New Orleans, large canneries are said to dominate the price picture. In Mississippi control of prices has been said to rest with the fishermen's union. In Alabama, the trade seems to be convinced that the breaders determine prices paid for shrimp, and in Texas this power is ascribed to the large coast-wide buyers for breaders or freezers.

Actually, it appears that no single group has sufficient economic control of the market to set prices. The prices, as ultimately negotiated, result from a compromise. Evidence of the power of individual interest groups participating in price negotiations in specific markets can be found. In the Biloxi area where about 85 percent of the shrimp landed are canned, and a similar percentage of the larger boats are cannery-owned, the cannery's offering price frequently becomes the price at which sales actually are transacted. This has been true only since the antitrust conviction of the local fishermen's union.

Naturally, if the prices offered are too low, the independent boat owners seek other outlets for their catches.

Sales Terms and Agreements

The need for working capital is paramount to the fisherman. For this reason, sales from an independently owned boat are usually made on a cash basis. Raw shrimp plants must pay cash to maintain the patronage of boats.

Few sellers maintain contractual agreements with buyers. In those cases where a boat is tied, by reason of fleet affiliation, to a particular dealer or cooperative, it sells exclusively to that organization when docking in the home port. Otherwise, boats are free to sell their catches to the buyer of their own choice. Since prices paid to the fisherman in any one port usually are uniform throughout the port, the choice is based upon services offered by the buyer rather than upon price.

Selling arrangements beyond the level of the boat are also characterized by a lack of contractual agreements. Primary wholesalers prefer to sell on the open market to the highest bidder rather than tie themselves to an individual buyer. A few primary wholesalers do sell solely to one buyer, feeling that in times of market glut the buyer will purchase their shrimp before going to a competitor. Even under these circumstances no written contract exists. Since supply, in recent years, has frequently lagged behind demand, there is little reason for a primary handling or processing firm to tie itself to a single buyer.

Sales from the raw shrimp plant to a processor located some miles from the docks may be based on either box or pack-out weight. If sold box weight, the shrimp are rough graded at the dock, i.e., four or five counts are made per box and the average of these is considered to represent the count of the entire box. Boxes are usually packed 102 to 106 pounds, the excess being an allowance for water and waste. The seller is paid according to "estimated" weight, which means that he does not guarantee true weight. If the shrimp are sold pack-out weight, they are sent ungraded to the freezer. There a complete and accurate grading takes place and the fishermen are paid on true weight.

If the shrimp are sold pack-out weight, the seller assumes transportation costs to the freezer, usually at the rate of one cent per pound. If the shrimp are purchased on a box weight basis, the buyer usually bears these transportation costs.

There is some disagreement as to the relative merit of the two methods. When the shrimp are sold box weight, the shrimp plant operator knows immediately what the value of a shipment is and can pay the fisherman as soon as his catch is unloaded. The fisherman and shrimp plant operator believe that the buyer stands to profit by buying box weight, inasmuch as they feel that a box will bring more when closely graded. For this reason, the seller prefers box weight only in cases where the shrimp run somewhat smaller than the average within the grade interval. From the seller's point of view, the choice is essentially between the relative convenience of the box weight system and the possibility of obtaining a slightly better price when selling pack-out weight.

Prices on the producing level of the industry may be quoted either in pounds or by the barrel. In general, in the States of Mississippi and Louisiana quotations on the barrel are more common, while the pound is the accepted unit of measure elsewhere. The distinction is not a particularly important one, in that either unit may be easily converted to the other. A barrel of shrimp weighs 125 pounds on a "heads-off", or 210 pounds on a "whole" basis.

Wholesale and Retail Operations--Introductory

The marketing of shrimp products at the wholesaler's and retailer's level was surveyed for the United States Fish and Wildlife Service by the A. C. Nielsen Company. The survey consisted of questionnaire interviews of secondary wholesalers and retailers of shrimp products as well as an audit of retail sales and inventories and a merchandising experiment made for the purpose of studying the sales of products at retail under specially controlled marketing conditions. The great bulk of shrimp products are marketed frozen. Since the practices used in marketing such products are similar to those used for frozen foods generally, they easily become a part of the marketing system for frozen foods. The next two sections describe wholesale and retail operations of this system.

Wholesale Operation

Wholesalers receive their frozen products either by railroad refrigerator car or by refrigerated truck from the warehouses of producers or distributors. Some wholesalers pick up their frozen foods with their own refrigerated trucks. Wholesalers who do not have their own warehouses usually rent refrigerated rooms in a warehouse for use as a working area in which frozen food orders can be assembled and dispatched.

Frozen foods are wholesaled either on receipt of an order at the plant or directly from the truck as outlets on a route are visited. Orders are assembled for delivery accordingly. If the food is sold in advance of delivery, each order is assembled as a separate unit and dispatched by a regular delivery truck. If the frozen food is sold from the truck as each retail store is visited, the truck

is usually loaded with an assortment of merchandise, and the order is put up at the store. The small retail store that does not have adequate frozen food cabinet or storage space expects to receive service based on immediate needs.

The relative volume of frozen foods sold at large and at small food markets indicates that more sales are being made on receipt of an order in advance than are made at the store by the truck salesman. The trend, therefore, is toward large orders rather than toward small ones.

Exposure of the food to temperatures higher than that of the cold storage room should be as short as possible during the transfer of frozen foods from storage to the order-assembly room. Frozen foods that are held over from one day to the next in the order-assembly room should not be stacked against walls, ceiling, or directly on floors, as the product may absorb heat. Inventories in the assembly room should be limited to one week's supply, and there should be a complete turnover of the products in the room every week. Order-assembly rooms should be maintained at 0° F. and should be defrosted regularly to prevent loss of refrigeration efficiency.

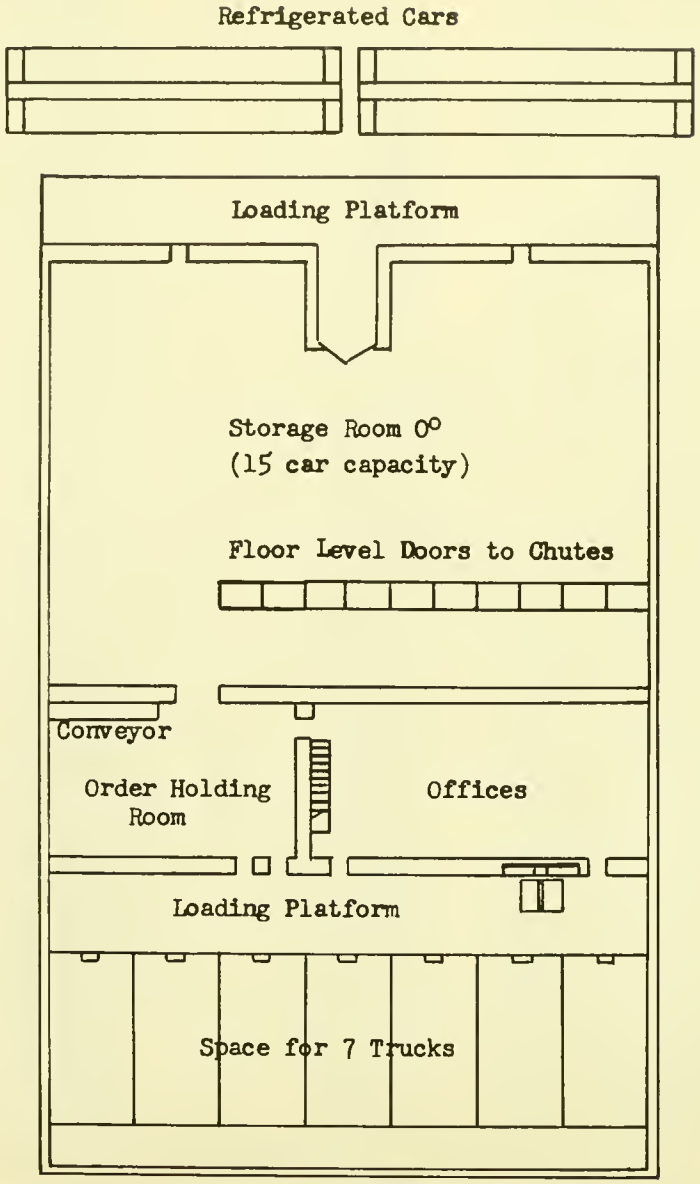
Figure VI - 1 shows a possible layout for a frozen food wholesale plant with an extra order-assembly room in the basement for the assembly of mixed cases only. As each customer's order comes to the assembly room, the items requested are listed on an order sheet. Items that require less than a full case are repacked with other items to make full cases. Containers are then marked with the customer's number that corresponds to his number on the order sheet. Each order, when assembled, is stacked carefully into tiers that will not fall and are marked clearly with a lot number to avoid loss of time and unnecessary opening of the truck doors when the order is loaded into the truck. Orders should not be placed on the loading platform until the truck is ready to be loaded. If the temperature of the order-assembly room is above 10° F., the orders should be made up promptly and returned to storage at 0° F., unless they are scheduled to be loaded immediately.

A more common type of order-assembly room has frozen foods in cases stacked on both sides of a conveyor belt running the length of the room and out onto the truck-loading dock. Cases destined for delivery are transported via the belt directly into the truck.

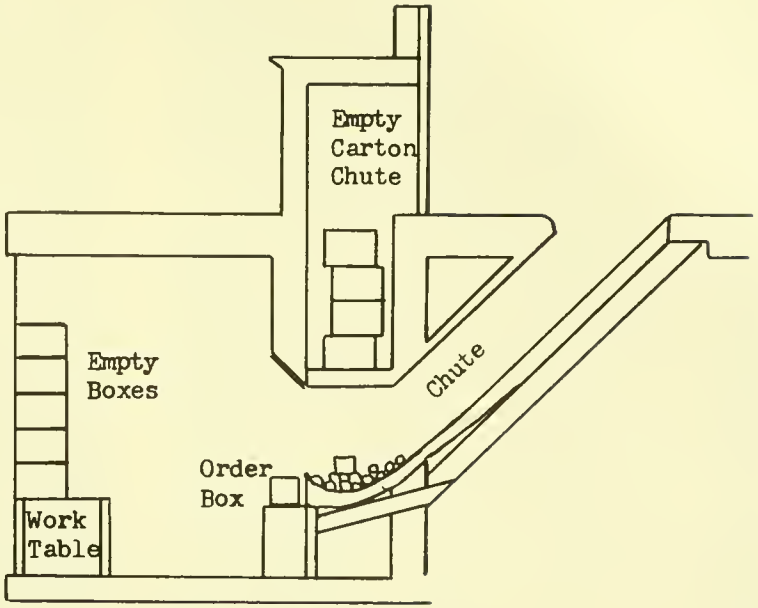
Transportation from Wholesaler to Retailer

Frozen shrimp products are delivered to small food stores in trucks of 3- to 5-ton capacity, and to food-market chain stores in trucks of 10-, 15-, or 20-ton capacity. Other frozen foods may be delivered at the same time. The amount of refrigeration provided in delivery trucks

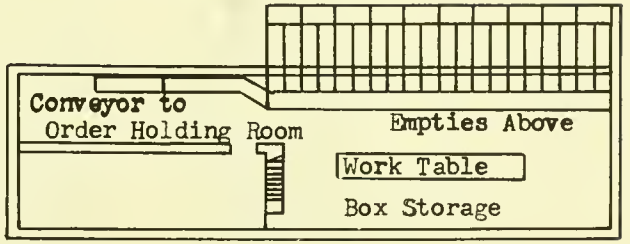
FIGURE VI - 1.--LAY-OUT FOR A FROZEN FOOD WHOLESALE PLANT



First Floor Plan



Section of Order Assembly Room



Basement Plan

varies. Some retail stores may obtain their products at wholesale, using nothing more than an open truck, with dry ice and an insulated blanket as protection. The standard practice with small lots is to handle them in an insulated shipping box. If such a box is used it is precooled (held in a cold room until the temperature of the box drops to 0° F.) It is then filled in the order-assembly room and held at 0° F. until shipped. The filled box is usually charged with dry ice for all trips exceeding 12 hours' duration. On arrival at destination, the box is kept closed until the product can be transferred to storage at 0° F. Frozen shrimp are usually transported from wholesaler to retailer in trucks, but a relatively small amount is transported in refrigerator cars or by air freight.

Frozen shrimp are most commonly transported in well-insulated trucks. The amount and type of refrigeration provided varies. Trucks equipped with mechanical refrigeration, dry ice refrigeration, or stored refrigeration in "hold-over" plates have proven to be satisfactory.

The low temperature necessary for preservation during long hauls can best be obtained by employing mechanical or dry ice refrigeration. Thermostatically controlled mechanical refrigeration units are usually operated by separate internal combustion engines, little or no attention is required during transit. With dry ice units, care must be taken to replenish the dry ice during transit. Trucks refrigerated by means of "hold-over" plates are best suited for transportation over comparatively short distances since they provide only limited refrigeration.

Refrigerated delivery trucks are designed merely to absorb the heat introduced in transit and not to lower the temperature of the product or serve as storage space. Best results are obtained if precooled trucks are loaded quickly in the morning instead of the night before deliveries are to be made.

Retail Operation

Facilities for the storage of large reserves of frozen foods usually are not found in the retail store. Most retailers only have retail-display cabinets, some of which are large enough for a small reserve. This arrangement requires almost daily replenishing by the wholesaler. Stores having a large volume of business need additional storage. Some retail stores have walk-in storages, others have the older chest-type storage cabinets for holding reserve supplies.

Frozen-storage facilities at the retail level are governed by the same factors that apply to order-assembly rooms, except that the temperature should be held at 0° F. or lower. Inventories should be limited to one week's supply, and a complete turnover of the products in storage should occur every week. The facilities should be defrosted regularly.

Modern merchandising requires displays that place the frozen foods in quantity before the eyes of the customer to facilitate impulse buying. The only display cases that fulfill such a requirement are the large self-service open-type having their entire contents accessible at all times. These modern cases are usually quite deep to provide a well for the retention of low-temperature air, yet wide enough so their contents are easily accessible. The average food store requires at least 25 linear feet of display case to provide room for the variety of frozen foods that are available.

Automatic dispensing cabinets for frozen foods have been used on a trial basis, but they do not provide for the mass display desirable in merchandising. Frozen-food cabinets with sliding glass doors or hinged top-opening lids without bulk storage below the display portion of the cabinet were used quite successfully in the past. Some of these cabinets are still in use, but they do not encourage impulse buying or provide easy access to the foods as do the self-service open-type cases.

The quality of frozen shrimp is usually subject to greater deterioration during marketing than it is during cold storage. Marketing exposes the product to the most severe conditions. It is even possible for isolated packages or cases of the product to thaw in transit from the wholesaler or while in the retail store through lack of necessary precautions.

SURVEY OF WHOLESALE AND RETAIL DISTRIBUTION

Secondary Wholesalers'[2] Practices

Marketing practices of a sample of 132[3] secondary wholesalers of shrimp products were ascertained in the course of a survey conducted by A. C. Nielsen Company in the fall of 1955. The sample of wholesalers was obtained from the purchase invoices in the files of 281 retailers included in the retail phase of the survey. A number of wholesalers considered representative of the total number of wholesalers supplying these retail establishments was selected.

2/ A secondary wholesaler by definition is a wholesale distributor who buys from primary wholesalers and sells to retailers and institutional outlets. A primary wholesaler in contrast purchases directly from the producer.

3/ Due to the necessity of eliminating distributors who furnished incomplete answers, the total number of firms actually used for the tabulation of questionnaire responses was only 121.

Both the wholesaler and retailer questionnaires used for interview purposes were designed along the same lines. After questions aimed at determining functions performed by respondents and channels of distribution, the remaining subject matters were grouped under the following headings:

(1) Availability of Product
(2) Processing and Marketing
(3) Distribution Problems
(4) Prices and Markups
(5) Product Preference and Product Competition
(6) Promotion and Consumer Demand

The answers to the questionnaire items were obtained through personal interviews with responsible officials of the sample firms by members of the A. C. Nielsen Company field staff.

Functions Performed

Over 23 percent of the secondary wholesalers in the sample specialized in the distribution of fish and shellfish products. The remainder either distributed a general line of grocery products, frozen food, fresh produce, catered to institutions, or did not confine themselves to any particular type of trade.

The function performed by the largest proportion (three out of four) of the secondary wholesalers was the transportation of deliveries. Over 55 percent provided cold storage facilities and 14 percent performed brokerage services. Other functions within the scope of the secondary wholesalers' operations were the transportation of the product from the supplier, repacking, cutting, cleaning, and special packaging.

Channels of Distribution

The answers to questions on channels of distribution indicate that secondary wholesalers did not rely on any one particular source in preference to others for their supplies of shrimp and other fish and shellfish products. Brokers ranked first among suppliers. Sources of supply were primary wholesalers' processing plants, including freezing plants and establishments specializing in the breading or canning of shrimp, as well as from other secondary wholesalers.

A tabulation of customers reveals that secondary wholesalers sold primarily to independent stores, with restaurants and chain stores ranking next as buyers of shrimp products. In addition, fish markets, institutional buyers other than restaurants, and other wholesalers accounted for smaller proportions of total sales of secondary wholesalers.

Shrimp sales of secondary wholesalers in 1954, according to the answers furnished to the A. C. Nielsen Company field investigators, were appreciably up over the preceding year. As many as 62 percent of the respondents stated that their volume of sales in 1954 exceeded their 1953 sales, while only 15 percent noted a decline. The remaining 23 percent of the wholesalers thought their volume was just about identical in the two years. Those wholesalers who noted an improvement in sales gave credit to the following factors:

Introduction of New Products:
- Shrimp Sticks
- Deveined Shrimp
- Shrimpburgers
- Frozen Uncooked Breaded

Better Packaging
Better Refrigeration - Storage
Better Refrigeration - Transit
Improved Handling
Improved Distribution Method
Better Merchandising
Increased Demand
Increased Consumer Income
Public More Seafood Conscious
Better Variety
Lower Prices
Serving More Stores - More Freezer Space
Greater Availability to Consumer
Special Promotions

A ranking of shrimp and other fish and shellfish products in order of relative importance from the standpoint of sales volume by the secondary wholesalers bears some resemblance to a corresponding ranking by retailers (see table VI - 10, p. 41). Both rankings clearly indicate that frozen shrimp, fish sticks, and uncooked breaded shrimp, are the three most popular items.

TABLE VI - 1.--SECONDARY WHOLESALERS' RANKING OF SELECTED FISH AND SHELLFISH PRODUCTS IN ORDER OF IMPORTANCE IN THE WHOLESALE MARKET, 1955

Product	Percent of secondary wholesalers ranking the product						
	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7
Fresh shrimp	11.7	1.9	4.9	-	-	1.0	1.9
Frozen shrimp	30.1	29.1	14.6	8.7	4.9	-	1.0
Frozen cooked breaded	3.9	13.6	11.7	2.9	4.9	9.7	1.0
Frozen uncooked breaded	21.4	20.4	13.6	13.6	5.8	3.9	-
Lobster and lobster tail	4.9	19.4	9.7	19.4	12.6	9.7	1.0
Frozen fish sticks	26.1	10.7	21.4	8.7	7.0	1.0	1.0
Frozen scallops	1.9	3.9	14.6	18.4	21.4	4.9	1.9
No rank stated	-	1.0	9.5	28.3	43.4	69.8	92.2

Availability of Product

Nearly half of the wholesalers interviewed indicated that they were not always able to obtain the shrimp products they had ordered. The greatest difficulty in this respect was experienced with frozen breaded cooked shrimp. Fresh and frozen packaged headless shrimp at times were not readily available. Seasonal fluctuations in the catch were primarily responsible for the fresh shrimp supply difficulties. The relative scarcity of frozen breaded cooked shrimp was explained by seasonal factors only to a minor extent.

Nearly four out of every five wholesalers seemed to be able to fill their supply requirements in the local market without having to pay higher than commonly prevailing prices.

Complaints about quality of products purchased were made by over 45 percent of the wholesale buyers. The complaints, by type of product to which they are applicable, are listed below.

TABLE VI - 2.--SECONDARY WHOLESALERS' COMPLAINTS ABOUT QUALITY AND APPEARANCE OF SHRIMP PRODUCTS PURCHASED, 1955

(Percent of wholesalers having complaints about quality - 45.5. Some wholesalers had more than one complaint.)

Type of product	Nature of complaint	Percent of wholesalers voicing complaint
Fresh shrimp	Variation in size	1.8
	Poor quality	3.6
	Iodine taste	3.6
	Complaint not specified	3.6
Frozen packaged headless shrimp	Variation in size	9.1
	Poor quality	20.0
	Iodine taste	5.5
	Lack of glazing	1.8
	Defrosted	5.5
	Complaint not specified	10.9
Frozen breaded cooked shrimp	Too much breading	1.8
	Complaint not specified	14.5
Frozen breaded uncooked shrimp	Too much breading	9.1
	Variation in size	3.6
	Uneven breading	5.5
	Iodine taste	1.8
	Complaint not specified	9.1

Processing and Marketing

More than one-third of the respondents to the wholesaler questionnaire thought that better processing and packaging, if accompanied by only moderate increases in costs, would aid the sale of shrimp products.

The following specific suggestions for processing and packaging improvements were made:

(a) Suggestions for processing :
1. Uniform size of shrimp
2. Better grading
3. Better quality
4. Avoid crystallization
5. More peeled shrimp

(b) Suggestions for packaging :
1. More attractive package
2. Transparent packages
3. Use of vignette on top of tin
4. 8 oz. packaged peeled shrimp
5. Hand pack
6. Mark of label on 5-pound packages
7. More 1-pound packages

Only seven percent of the wholesalers engaged in some kind of processing or packaging activity. Among the functions performed were the following: breading, freezing headless shrimp, and thawing and repacking.

Distribution Problems

Only a few of the wholesalers interviewed had difficulties in the disposal of shrimp products at any time during the 18 months preceding the survey. The reasons for the difficulties in these instances, as stated by the wholesalers, were seasonal slacks in demand, unattractive prices, or overshipments of product by the supplier.

During the same 18 months spoilage of product affected the inventories of one out of every four of the wholesalers in the sample. Inadequate refrigeration in transit was the principal reason given for such losses.

Prices and Markups

More than three-fourths of the wholesaler respondents adhered to a specific price and markup policy. Of those who had a policy applying to all fish and shellfish the proportion (80.8 percent) who used constant markups was over five times larger than the proportion who used different markups for each product. In a few instances, wholesalers allowed discounts on a quality or on a quantity basis or to certain classes of customers.

Two out of five wholesalers indicated that they changed prices of shrimp products more often than prices of other fish and shellfish products. Supply factors affecting costs were responsible.

Product Preference and Product Competition

Over 71 percent of the secondary wholesalers interviewed thought that the characteristics of the product and package had an effect on the sale of shrimp. This attitude is at variance with that of the retailers who, for the most part, were not convinced that the effect on sales was significant. The product characteristics considered in this connection, in order of importance, were: size, color, taste and freshness of shrimp, amount of breading, kind of package, package size, and ease of preparation.

A ranking of wholesaler customer preferences for shrimp products indicates that packaged frozen headless shrimp by far outsells any other product at this level (see table VI - 3). The indication of customer preference in this instance, seems more pronounced than in the case of ultimate consumers, as shown by a similar ranking of consumer preference made by retailers (see table VI - 11). Ranked next after packaged frozen headless shrimp by the wholesalers were frozen uncooked breaded, frozen cooked breaded, and fresh shrimp.

Promotion and Consumer Demand

About one out of every four wholesalers put more effort into the promotion of fish and other shellfish products than into the promotion of shrimp. Products promoted more actively, in the first order, were fish sticks, tuna pies, and fillets. Types of promotion most popular with the wholesale trade were through emphasis on brand names, newspaper advertisements, allowances granted, leaflets, radio and television commercials. The benefits to be derived from advertising of shrimp products, whether on a local or national basis, were almost unanimously acknowledged by the wholesalers.

Some of the wholesalers interviewed featured shrimp in the line offered to the retailer or joined the retailer in the promotion of the product. In a few instances, wholesaler promotion took the form of special bonuses for salesmen, price cuts, intensified contacts with institutional customers, improvement of labels, and sponsorship of sales contests in conjunction with packers.

TABLE VI - 3.--SECONDARY WHOLESALERS' RANKING OF THE RELATIVE POPULARITY OF SHRIMP PRODUCTS WITH THEIR CUSTOMERS, 1955

Product	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7
	(Percent of secondary wholesalers ranking the product)						
Fresh	10.9	7.9	2.0	2.0	1.0	-	4.9
Frozen	51.5	38.6	3.0	2.0	-	1.0	1.0
Cooked breaded	4.9	20.8	11.9	6.9	1.0	1.0	-
Uncooked breaded	29.7	19.8	21.8	2.0	2.0	2.0	-
Shrimp sticks	-	-	4.0	4.0	6.9	1.0	2.0
Shrimp creole	-	-	4.0	5.9	4.9	6.9	-
Shrimp cocktail	-	2.0	11.9	6.9	3.0	3.0	-
Canned shrimp	2.0	4.9	2.0	1.0	-	-	-
Shrimpburger	1.0	-	-	-	-	-	-
Unranked	-	6.0	39.4	69.3	81.2	85.1	92.1

Wholesaler preferences for featuring shrimp and other selected products together with package size preferences are listed in table VI - 4 Part A and Part B.

TABLE VI - 4.--SECONDARY WHOLESALERS' RANKING OF THEIR PREFERENCES FOR FEATURING SHRIMP AND OTHER SELECTED FISH AND SHELLFISH PRODUCTS, 1955

Part A

Product	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7
	(Percent of secondary wholesalers ranking the product)						
Fresh shrimp	12.0	2.4	1.2	-	1.2	-	.4
Frozen shrimp	29.5	29.3	12.2	8.5	4.9	-	-
Cooked breaded	8.5	9.8	13.4	8.5	1.2	-	-
Uncooked breaded	25.6	18.3	11.0	6.1	2.4	-	-
Specialty	1.2	2.4	1.2	8.5	7.3	-	-
Fish sticks	23.2	18.3	24.4	3.7	-	2.4	-
Tuna pies	-	6.1	9.8	15.8	3.7	4.9	-
Unranked	-	13.4	26.8	48.9	79.3	92.7	97.6

TABLE VI - 4.--SECONDARY WHOLESALERS' PACKAGE SIZE PREFERENCES FOR SHRIMP PRODUCTS AND REASONS STATED FOR SUCH PREFERENCES (IN ORDER OF IMPORTANCE), 1955

Part B

Frozen shrimp	16 oz.	More profit Good demand
	12 oz.	Customer demand
Cooked breaded	10 oz.	Customer demand More profit
	12 oz.	Customer demand
	8 oz.	Ease of preparation
Uncooked breaded	10 oz.	Customer demand More profit
	12 oz.	Customer demand
	80 oz.	Customer demand
Specialty	6 oz.	Customer demand
	8 oz.	Customer demand

Among the efforts to feature shrimp products joint wholesaler-retailer promotion held the most promising prospects, according to the wholesaler respondents. In addition, introduction of new specialty products, price reductions, and emphasis on brand names--specifically for canned shrimp--and on high quality in the advertising appeal, were all considered helpful from a promotional standpoint.

About 17 percent of the wholesaler respondents occasionally joined retailers in featuring shrimp as a loss leader over the 18 months preceding the date of the interview. Breaded shrimp--uncooked and cooked--were the products most frequently featured in this manner. The special arrangements made with retailers and restaurants in featuring shrimp products included the following:

Joint merchandising
Advertising allowances
Special cooperative ordering
Cooperative delivery
Joint pricing
Price reductions

There was marked agreement between secondary wholesalers and retailers concerning the factors which had the greatest bearing on consumer demand for shrimp products. People in the trade believe that lower prices, higher average incomes, and the increased realization on the part of the housewife that shrimp dishes are easily prepared, tasty, and very nutritious, are primarily responsible for the growing favor shrimp have found among American consumers within the last decade.

Audit of Retail Store Operations

One part of the retailer phase of the A. C. Nielsen Company survey was an audit of operations of retail food stores distributing shrimp products. This audit was based on data furnished by a national panel of 20 fish and shellfish stores and 261 other retail food stores of the types which ordinarily would be expected to carry fish and shellfish products (classified in United States Census publications as grocery stores handling fresh meat, grocery stores not handling fresh meat, delicatessen stores, and country general stores). The stores were selected from a probability sample of 1,600 stores used by the A. C. Nielsen Company in the computation of its 'food index'. 4/

The audit covered the 2-month period of August and September 1955. Statistics collected in the course of the field investigation covered the extent of distribution, volume of sales, inventories, and prices for the principal types of shrimp products. In each instance, the data were expanded to obtain totals for all retail food outlets in the nation.

Extent of Distribution

At the time of the survey, the shrimp product most widely distributed in retail stores was canned shrimp. On the basis of the sample data it was estimated that 63 percent of the total number of grocery, delicatessen, fish and shellfish, and country general stores 5/ handled the canned product at some time during the months of August-September 1955. A much smaller proportion of stores handled fish-counter sales of fresh and bulk-frozen shrimp (6 percent) and packaged frozen shrimp products (frozen headless--30 percent, frozen uncooked breaded--33 percent, and frozen cooked breaded--23 percent).

4/ For a discussion of this index as well as of the methods employed by the A. C. Nielsen Company in its retail store audit procedure see A Brief Description of Nielsen Food Index and Nielsen Drug Index, Nielsen Company publication, 1955.

5/ The percentages in this section may be applied to 1948 Census figures. The 1948 Census of Retail Business listed a total of 412,931 grocery stores (including both stores handling fresh meat and stores not handling fresh meat), delicatessen stores, fish and seafood stores, and country general stores. Preliminary results of the 1954 Census indicate that the number of these stores has decreased since 1948. This is explained partially by the tendency toward fewer and larger stores, partially by a change in the Census cut-off which eliminated stores handling a volume from $500 to $2,500 annually formerly included in compilations.

The 6 percent of food stores which handled sales of fresh and bulk-frozen shrimp accounted for 29 percent of total food store business. 6/ The 63 percent of stores which handled canned shrimp accounted for 77 percent of total food store sales. This indicates that shrimp products were stocked primarily by the larger retail outlets.

Figure VI - 2 graphically illustrates the retail distribution picture of shrimp products. Since the retail distribution percentages were computed on the basis of total "exposure-to-sale" during the survey period, i.e., for stores which handled shrimp and shrimp products at any one time during the months of August and September 1955, they must not be interpreted as representing the extent of actual distribution on any given day. On October 1, the date of the inventory audit, the stores which had frozen shrimp in stock were estimated to account for only 53 percent of total dollar sales of all food stores in the sample as against the corresponding 61 percent of stores which carried frozen shrimp at some time during the 2-month period. The percentages for individual shrimp products were as follows:

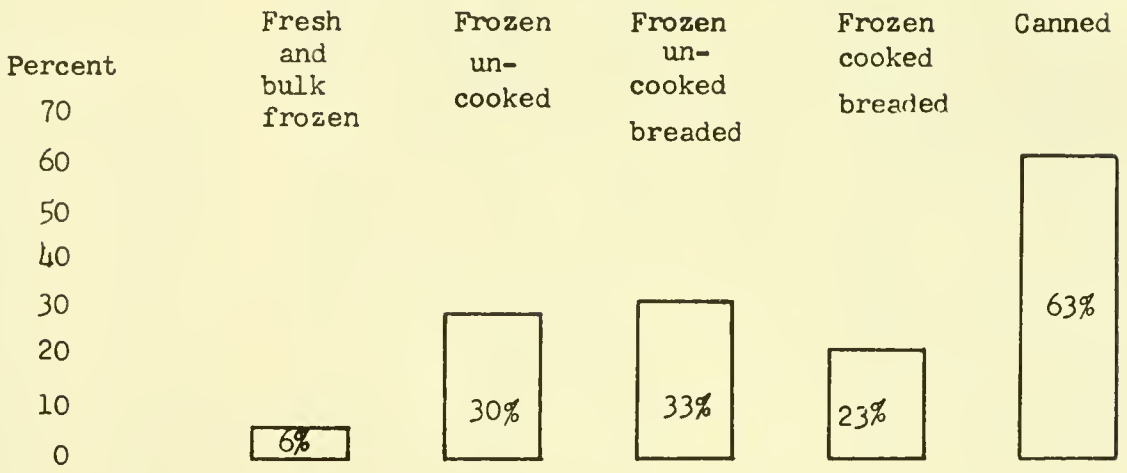
TABLE VI - 5.--A. "EXPOSURE-TO-SALE" MEASUREMENT

Shrimp product item	Percent of total food sales handled by stores who handle shrimp products		
	Had stocks on audit date	Were out of stock on audit date	Maximum distribution
	Percent	Percent	Percent
Fresh and bulk-frozen	22	7	29
Frozen, headless	53	8	61
Frozen uncooked breaded	46	6	52
Frozen cooked breaded	27	9	36
Canned	74	3	77

6/ Total sales for the five groups of stores represented in the sample in 1948 were in the neighborhood of $26.4 billion according to Census of Business sources. On the basis of preliminary statistics it can be estimated that the corresponding dollar total in 1954 was about 25 percent higher.

FIGURE VI- 2.--RETAIL DISTRIBUTION OF SHRIMP PRODUCTS, AUG.-SEPT. 1955

A.



B.

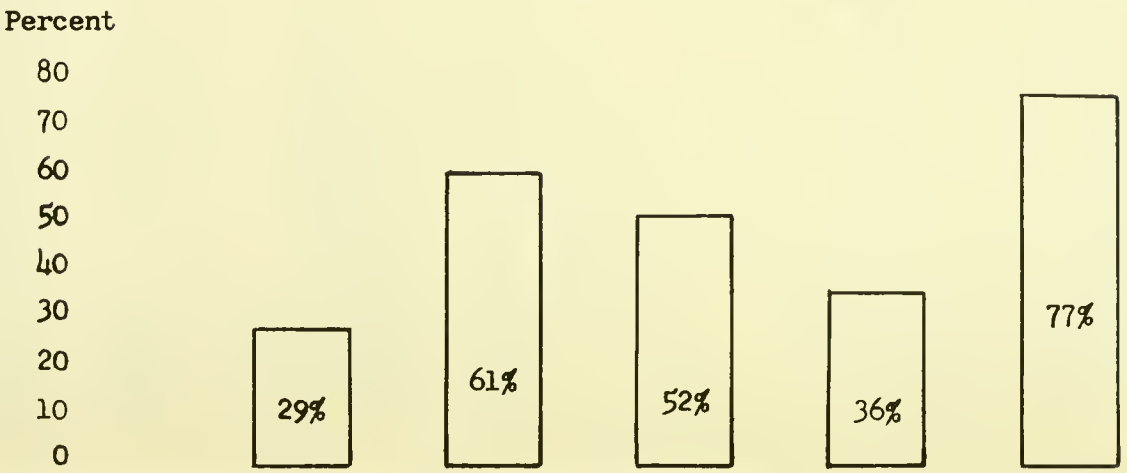


TABLE VI - 5.--B. "STORES HANDLING" MEASUREMENT

Shrimp product item	Percent of total food stores to food stores handling shrimp products		
	Who had stocks on audit date	Who were out of stock on audit date	Maximum distribution
	Percent	Percent	Percent
Fresh and bulk-frozen	4	2	6
Frozen, headless	25	5	30
Frozen uncooked breaded	29	4	33
Frozen cooked breaded	18	5	23
Canned	59	4	63

Note: "Stores handling shrimp products" refers to stores stocking shrimp products at some time between August 1, 1955 and October 1, 1955.

Retail Sales

The audit of sales involved the actual examination of purchase invoices. 7/ Both quantity and dollar value of sales for the 281 stores in the sample were determined. Expanded to a total for the country, some 27,280,000 pounds of shrimp and shrimp products were sold to retail customers in August and September 1955. Fish counter sales of fresh and bulk-frozen shrimp amounted to close to 14 million pounds, sales of packaged frozen headless shrimp to 7-1/3 million pounds. Breaded products--frozen uncooked breaded and frozen cooked breaded in that order--followed next with a total of about 3.5 million pounds. Canned shrimp and shrimp specialty products--i.e., shrimp cocktail, frozen cooked shrimp, shrimp creole, shrimp sticks, and others--made up the remainder, with approximately 1.8 million and 3/4 of a million pounds, respectively. (see figure VI - 3)

7/ The principles employed in determining consumer sales and other vital marketing data in Nielsen store audits are explained on p. 5, A Brief Description of Nielsen Food Index and Nielsen Drug Index, Nielsen Company publication, 1955.

FIGURE VI - 3 AND 4.--VOLUME AND VALUE OF CONSUMER SALES OF SHRIMP AND SHRIMP PRODUCTS

FIGURE VI - 3.

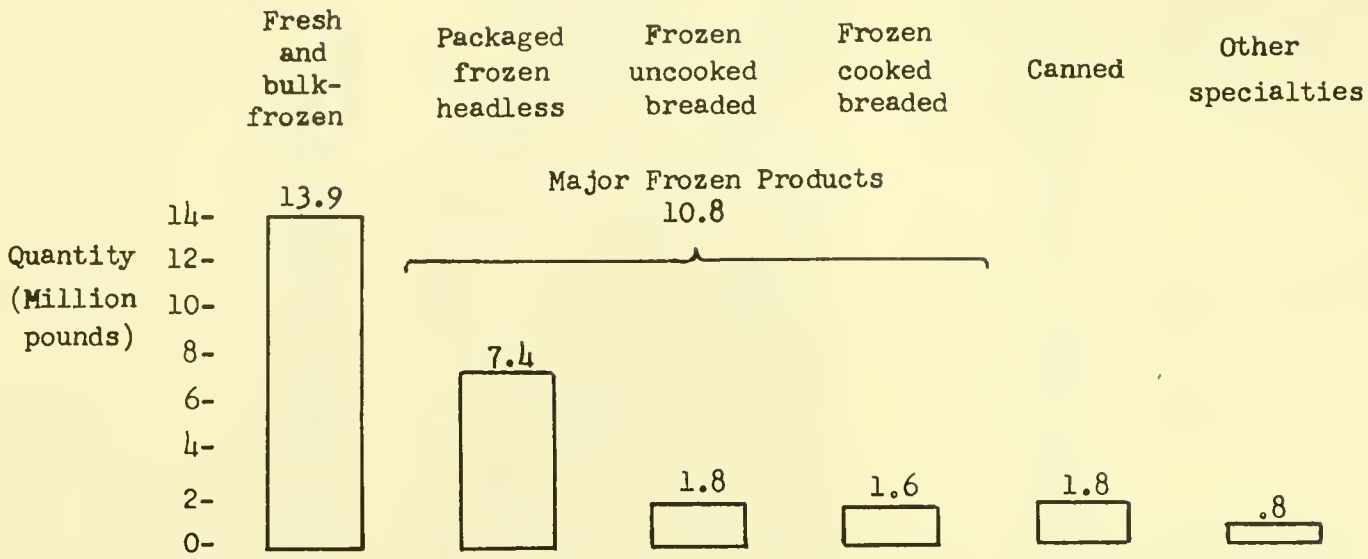
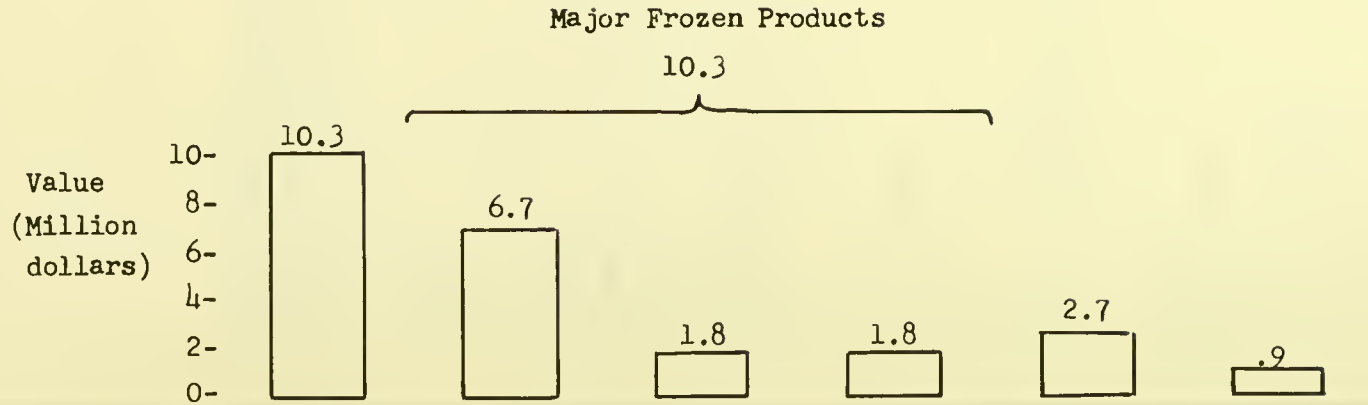


FIGURE VI - 4.



Shrimp dollar sales during the 2 months, expanded to a national total, amounted to $24,240,000. Of this total consumers paid $10.3 million for fish counter sales of fresh and bulk-frozen, and $6.7 million for packaged frozen headless shrimp bought in retail stores. Expenditures for canned shrimp were $2,730,000, for specialty products $910,000. Dollar sales of breaded products, with cooked and uncooked products accounting for nearly equal amounts during the audit period, were in the neighborhood of $3.6 million. (see figure VI - 4)

The percentage distribution of total retail sales of shrimp by type of product, both on a quantity and on a value basis, is shown in figure VI - 5.

The division of retail sales shows fish counter sales of fresh and bulk-frozen shrimp accounted for 51 percent of total quantity sold, but only for 43 percent of total value. Conversely, each one of the processed products represented a larger relative share of dollar sales than it did of pound sales, the difference between the two percentages being most pronounced for canned shrimp.

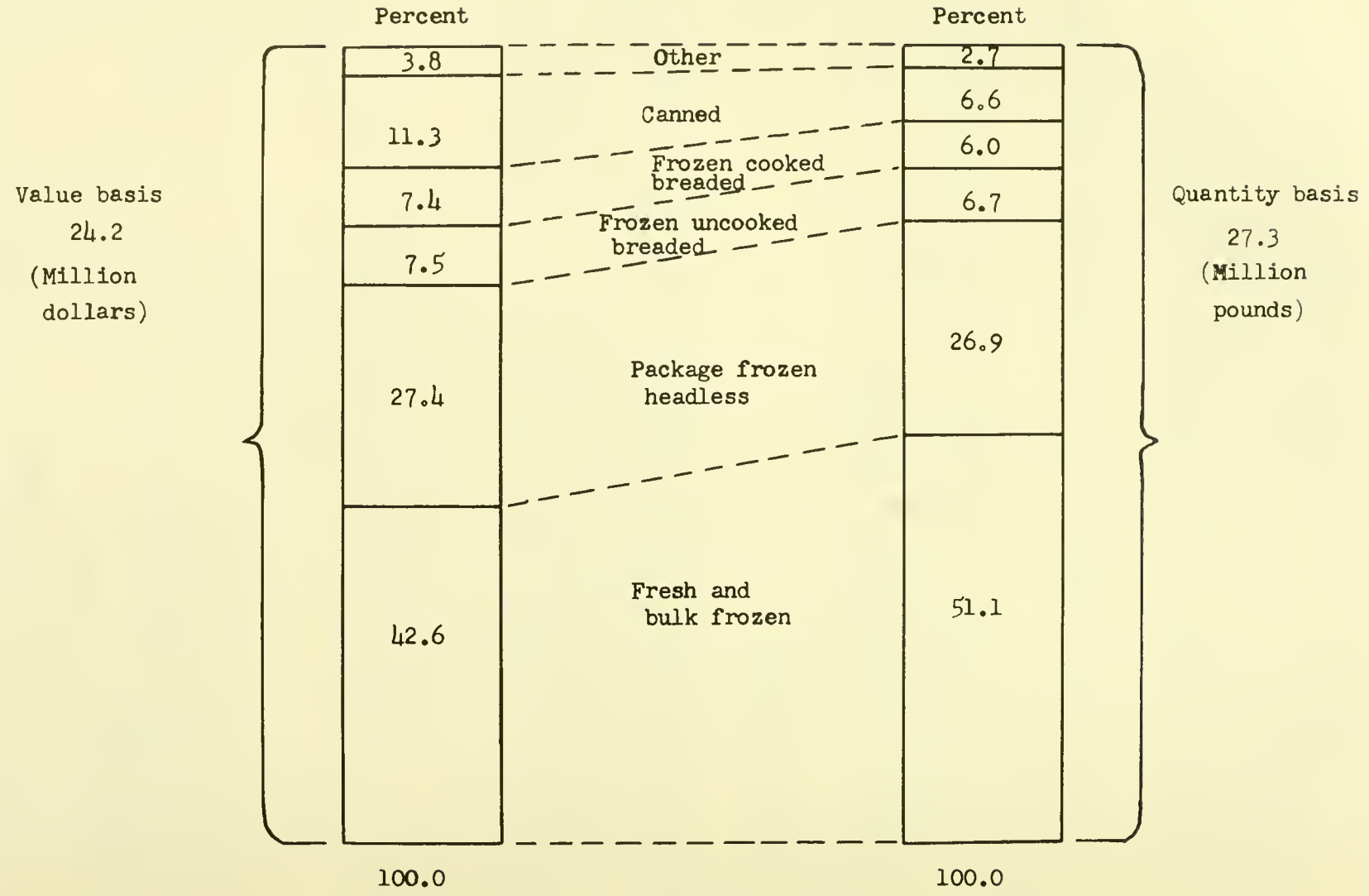
Retail Inventories

Inventories of shrimp and shrimp products at retail were ascertained as of October 1, 1955. Expanded to a total for the nation, these inventories were estimated to have been in the neighborhood of 8 million pounds on that day. Slightly more than 3 million pounds or 38 percent of this total were represented by fresh and bulk-frozen shrimp stocks. Packaged frozen headless shrimp ranked next with 26 percent of total shrimp stocks carried by retail stores followed by canned shrimp with 22 percent. Smaller quantities were stored of frozen breaded uncooked and cooked shrimp and shrimp specialty products.

TABLE VI - 6.--INVENTORIES OF SHRIMP AND SHRIMP PRODUCTS IN RETAIL FOOD STORES OCTOBER 1, 1955

Item	Pounds as of October 1	Percent of total
Fresh shrimp and bulk-frozen	3,031,000	38.0
Frozen packaged shrimp	2,066,119	25.9
Frozen uncooked breaded shrimp	587,800	7.4
Frozen cooked breaded shrimp	299,094	3.8
Canned shrimp	1,779,721	22.3
Remaining products combined	212,027	2.6
Total all shrimp and shrimp products	7,975,761	100.0

FIGURE VI - 5.--DIVISION OF RETAIL SALES (SHRIMP AND SHRIMP PRODUCTS) AUG.-SEPT. 1955



In terms of days' supply on hand these inventories represented over 14 days of fresh and frozen, 20 days of breaded frozen uncooked, 11 days of breaded frozen cooked, 60 days of canned, and 17 days of shrimp specialty requirements. The fact that relatively much higher stocks of canned than fresh or frozen shrimp products were kept is explained by the greater perishability of the latter products and the competition of other frozen fish and shellfish and non-seafood products for limited space in retail display cabinets.

Retail Activity in Shrimp Products

The division of shrimp retail sales and inventories by principal products is illustrated in figure VI - 6.

The average monthly sales volume (determined from the bi-monthly national totals computed from the sample data) and the average inventory per store handling shrimp are shown in figure VI - 7. On the average, stores handling fresh and bulk-frozen shrimp sold 281 pounds in a month and had over 122 pounds on hand at any given time. Average volume of sales and inventories of packaged frozen and canned shrimp products per store were substantially smaller.

Prices and Gross Profits

Retailer gross profits on shrimp and shrimp products were determined by comparing retail prices with retail purchasing costs.

The average cost to the consumer of a pound of fresh and bulk-frozen shrimp during the months of August and September 1955 was 74 cents. The prices paid at retail for frozen products ranged from an average of 91 cents per pound of frozen headless to $1.09 per pound of frozen cooked breaded shrimp. Canned shrimp was most expensive with consumers paying on the average $1.53 per pound for this product.

Average costs per pound to the retailer were obtained by dividing pounds purchased into dollar billings as taken directly from the invoices of the suppliers. Figure VI - 8 compares these costs with consumer prices and shows retailers' gross profits both in dollars per pound of product sold and as percentages of consumer prices.

The figures indicate that retailer pricing during the two survey months was based on markups of 21-1/2 cents for both fresh and packaged and unpackaged frozen headless shrimp, 27 cents for breaded shrimp, cooked or uncooked, and 35-1/2 cents for canned shrimp. In percentage terms, the biggest margin (calculated as a percent of sales price) was on fresh shrimp (29.0 percent), the smallest on canned shrimp (23.3 percent).

FIGURE VI - 6--PHYSICAL VOLUME OF SALES (AUG.-SEPT. 1955) AND RETAIL INVENTORY (OCT. 1, 1955) OF SHRIMP AND SHRIMP PRODUCTS

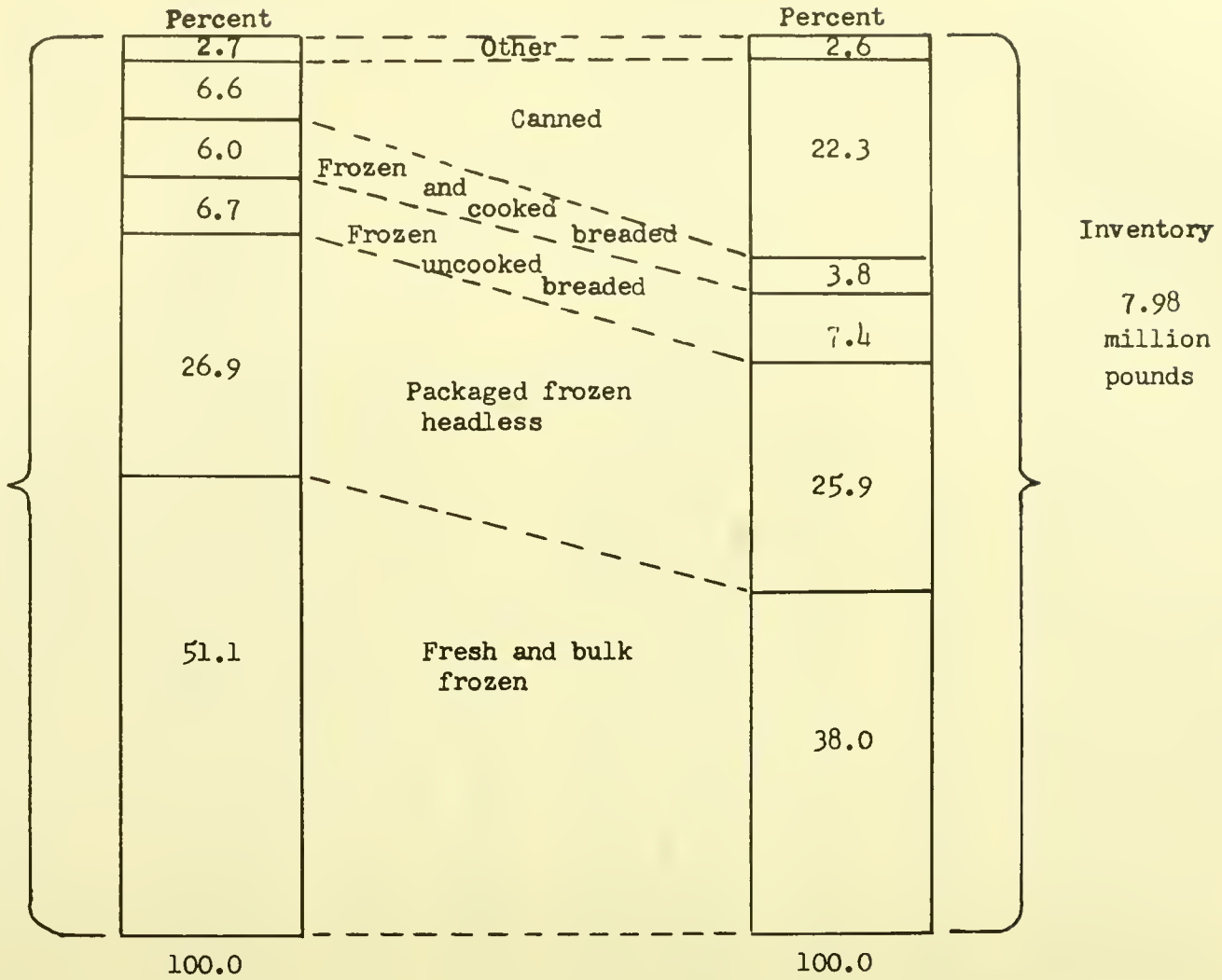


FIGURE VI - 7.--AVERAGE MONTHLY VOLUME OF SALES AND AVERAGE INVENTORY PER STORE, AUGUST - SEPTEMBER 1955

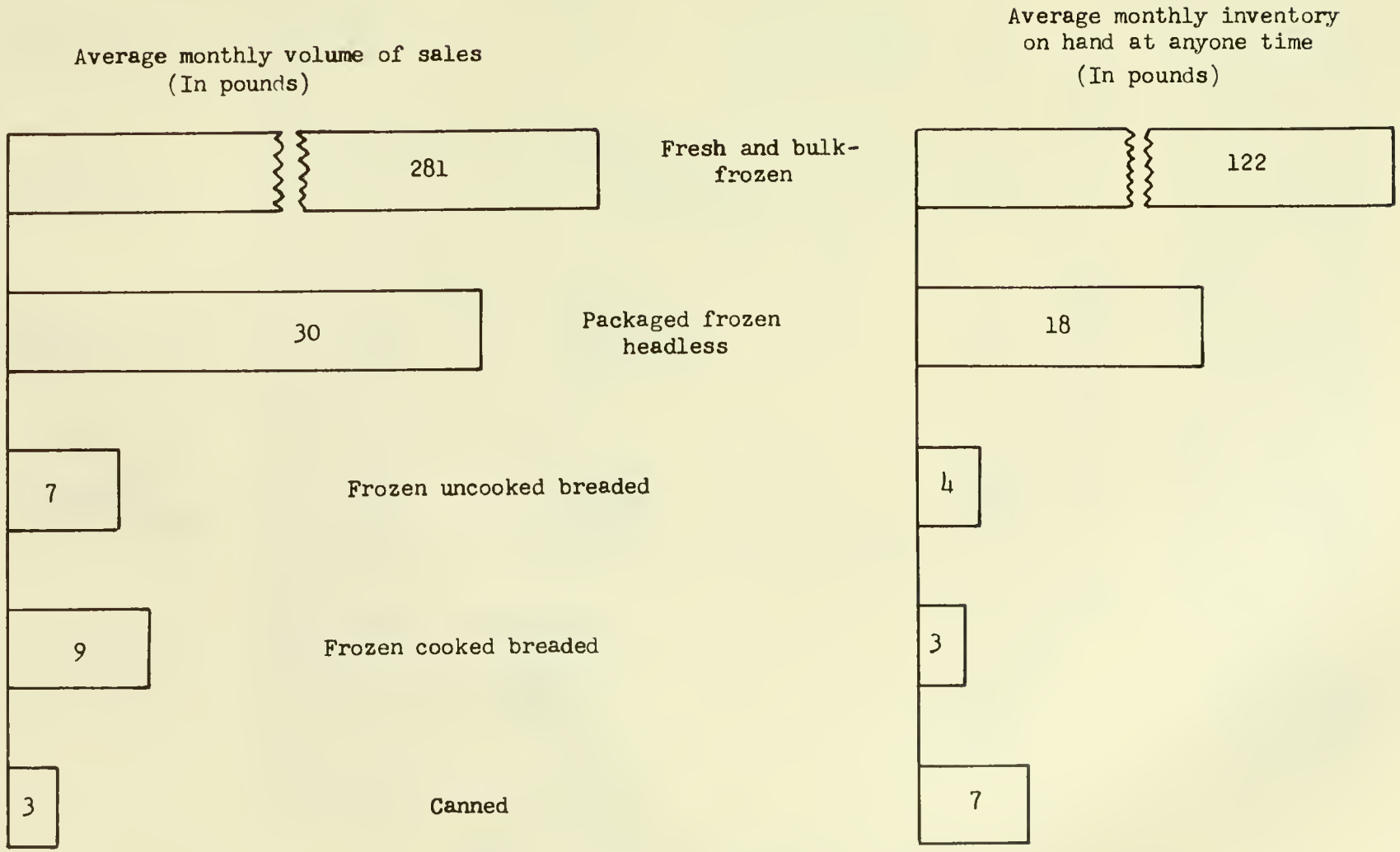
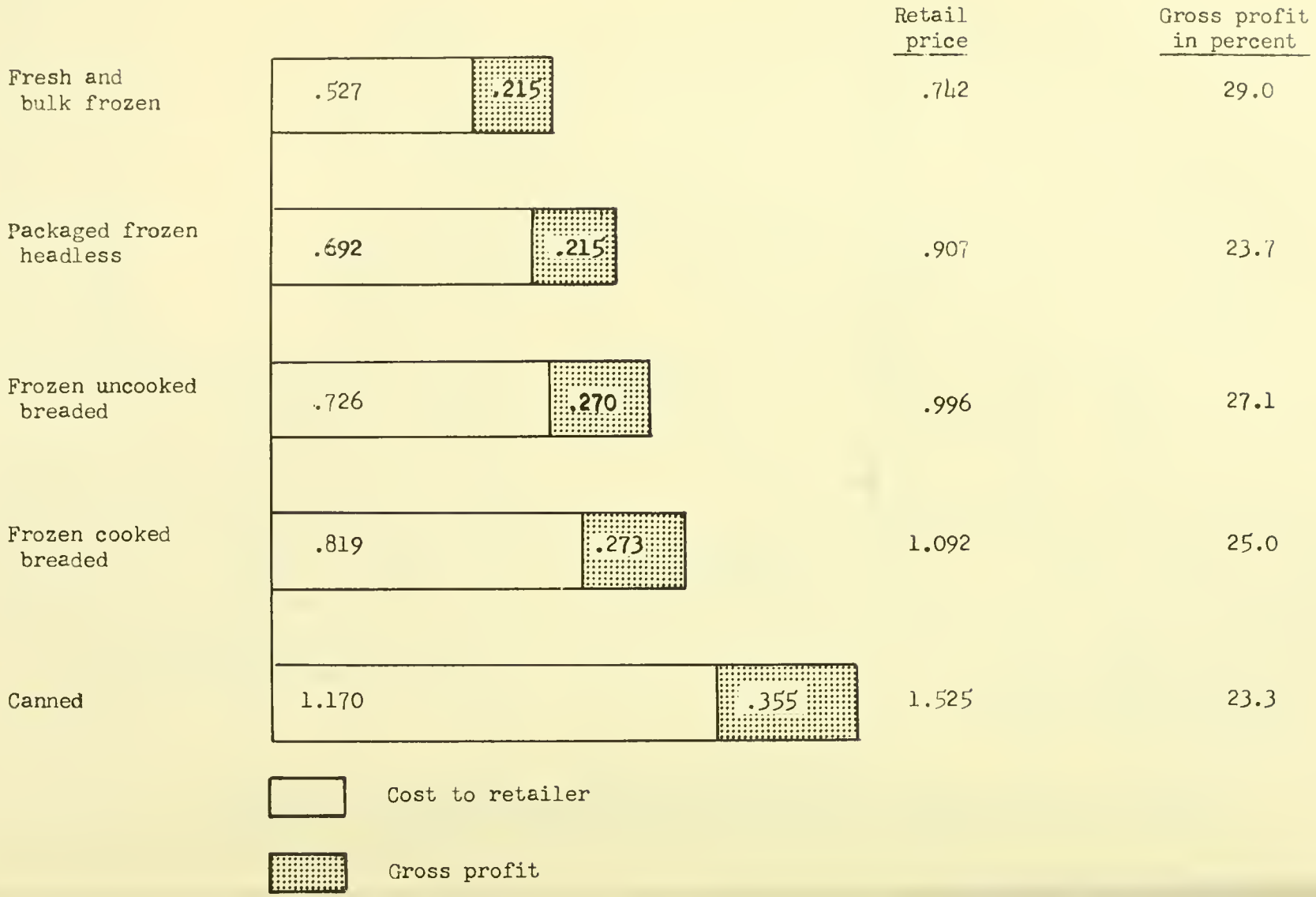


FIGURE VI - 8.-- AVERAGE PRICE PER POUND IN DOLLARS OF SHRIMP AND SHRIMP PRODUCTS IN RETAIL FOOD STORES, AUG.-SEPT. 1955



In the long run perishability, cost of special storage and display facilities, and rates of turnover, in addition to supply and demand factors and competitive conditions, are among the important elements which account for the difference in retail margins. Caution must be exercised in comparing gross profit ratios for shrimp products to similar ratios for other grocery store lines. Typical margins for such lines which were furnished to the United States Fish and Wildlife Service by A. C. Nielsen Company are reproduced below.

TABLE VI - 7.--AVERAGE GROSS PROFIT MARGINS AT RETAIL, SELECTED GROCERY LINES, 1955

Product class	Average gross profit as percent of retail price
Canned vegetables	23.5
Canned fruit	22.9
Paper products	21.3
Tea (package and bag)	20.9
Ready-to-eat cereals	16.5
Soluble coffee	11.1
Packaged detergents	9.8
Regular coffee	7.2

More meaningful comparisons, perhaps, can be made on the basis of markup percentages for competing fish and shellfish products obtained by the Nielsen Company in connection with its study of retailer attitudes and marketing practices (see the last part of the retail phase of this survey). These percentages as well as similar markup percentages computed for shrimp and shrimp products are shown in table VI - 8.

The average markups on shrimp products, by comparison with competing fish and shellfish products, appear to be relatively high on the basis of this tabulation. On fresh shrimp the markup was nearly 41 percent against 25 percent on all fresh fish. On the other hand, it was below the 50 percent which was the higher limit of the range of fresh fish markups. Similarly, the average markup on frozen shrimp was well above the average markup on frozen fish, but below the higher limits of the markup ranges for these products.

TABLE VI - 8.--RETAILER MARKUPS ON COST OF SHRIMP AND SELECTED FISH AND OTHER SHELLFISH PRODUCTS, 1955

Item	Average markup on cost to the retailer	Range
	Percent	Percent
Fresh shrimp	40.8	Not available
Frozen shrimp	31.1	" "
Frozen uncooked breaded shrimp	37.2	" "
Frozen cooked breaded shrimp	33.3	" "
Canned shrimp	30.3	" "
Frozen products		
Frozen salmon	22	5-40
Frozen halibut	23	5-45
Fresh fish	25	5-50
Frozen fish	22	5-40
Creole shrimp	22	10-35
Fish sticks	21	10-35
Tuna pies	25	10-50
Breaded scallops	23	10-60
Canned products		
Canned tuna	20	6-35
Canned salmon	22	8-40
Canned sardines	22	8-35

Investment in Retail Inventories and Turnover Rate

The average value of retail inventories in August and September 1955, as computed on the basis of retailer purchase costs, was approximately $6.7 million. If this inventory value is accepted as representative for the entire year 1955, the average amount of gross profit realized (based on the total gross profit estimate of $35 million) per dollar of inventory invested was $5.20.

By dividing the estimated average value of inventory ($6.7 million) into the estimated annual dollar volume of sales ($133 million) a turnover rate for shrimp products is obtained. The resulting figure--19.9--corresponds to the rate listed as the 1954 average for independent retail grocery establishments by Dun's Review and Modern Management (see October 1955 issue, "Fourteen Important Ratios, Retail Lines").

Retail Merchandising Experiment

The merchandising experiment conducted by the Nielsen Company had as its object the determination of the effect on sales volume of increased availability of product and package sizes and in-store advertising displays. A total of 12 retail food stores handling frozen shrimp products was selected for the study, with three outlets each located in the metropolitan areas of New York, New York; Chicago, Illinois; Harrisburg, Pennsylvania; and Waterloo, Iowa.

The period for which sales activity in these stores was studied extended over 6 weeks in the fall of 1955. During the first biweekly interval store operations in connection with the sale of shrimp and shrimp products remained the same as during the period preceding the start of the experiment. Each retailer was requested to stock the items he normally stocked and confine himself to usual promotional activity. During the second biweekly interval the retailer agreed to add new products and package sizes in quantities commensurate with his facilities for stocking and displaying the added items. In the third biweekly interval the retailer continued to stock and display the items added during the preceding period and was given printed display material to determine the effect of increased promotional activity. He agreed to display the material, which consisted of a window streamer and a display placard to be placed at or above the freezer compartment, for the remainder of the control period.

Identical control conditions were applied to all 12 stores. While there was ample evidence that all participating retailers cooperated in the merchandising experiment, the emphasis provided by individual retailers in promoting shrimp products varied to some extent. In addition, it was noted that several stores had difficulty in obtaining the items they had agreed to stock. This may account for the fact that sales, after promotional activity had been increased, in some instances did not react as favorably as had been expected.

A certain amount of distortion in the statistics affecting all stores may have been introduced by the circumstance that the third biweekly interval included Thanksgiving Day. Since shrimp dishes are not part of the traditional Thanksgiving Day fare, the effect of intensified promotional activity in the last period of the survey probably was understated.

Summary of Results

Judging from all appearances the merchandising experiment was a success. Total sales of fresh and frozen shrimp of the 12 stores was 62 percent greater in the second 2 weeks than in the first 2 weeks under the impact of more complete stocking of products and package sizes. An additional increase in consumer sales of 14 percent was realized during the third biweekly interval when the special promotional material was used.

Detailed Observations

Total sales of fresh and frozen shrimp products of the 12 stores participating in the experiment rose from 151.4 pounds during the first, to 245 pounds during the second, and to 279.1 pounds during the third, biweekly period. Figure VI - 9 shows both the combined, as well as the separate, increases for fresh and packaged frozen products. The big boost in sales of fresh shrimp effected during the second 2-week interval has to be credited principally to the addition of fresh shrimp to the line of a Chicago supermarket which prior to that time had limited itself to the marketing of frozen breaded uncooked shrimp.

Separate data for the four metropolitan areas covered are shown in figure VI - 10. Fresh shrimp was handled only by 3 of the 12 stores, 2 of them located in New York, 1 in Chicago. Sales of frozen products reacted favorably throughout the duration of the experiment in New York and Chicago; in Harrisburg they dipped during the third 2-week period after a rise during the second 2-week period; in Waterloo they declined originally but recovered substantially in the last 2 weeks to a level well above the first biweekly interval.

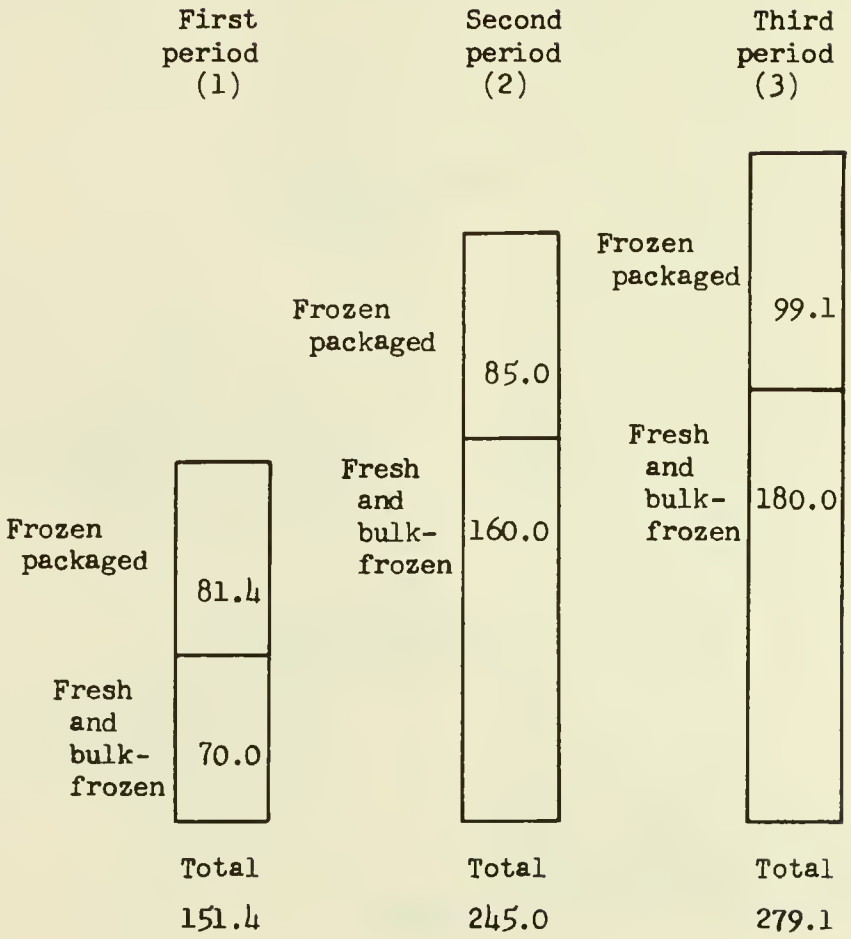
More light is shed on the experiment when the operations of the individual participating stores are analyzed. Altogether 9 stores out of the 12 audited appeared to benefit from the additional sales stimuli provided. Sales in three stores showed progressive declines over the three survey intervals. The Nielsen Company comments on these differences in results as follows: "It has been our experience that in any test procedure it is unusual that the consumer sales trend would be identical in all participating stores. Causes are frequently external, resulting sometimes from competitive product, and even competitive store, activities. Over-all gains made during promotions are often composed of multi-directional trends in all stores included in the sample".

A special effort was made to identify the reasons for the individual departures from trend. Two stores in the Harrisburg sample showed significant decreases in sales during the third survey interval after a favorable response during the second 2-week period. It was surmised that competitive product promotion around the Thanksgiving season had some influence on this reversal. One of the Waterloo stores failed to add new items on the grounds that the time of the year was unfavorable for the sale of shrimp. The substantial increase in sales in this city during the third period was the result of added newspaper advertising by another local store. Two of the stores in the Chicago metropolitan area reported that their wholesalers were out of stock, one of the stores showing the effects by failure of its sales to pick up during the course of the experiment. There was no obvious explanation for the relatively indifferent showing of one Brooklyn, New York, store in the third biweekly interval.

FIGURE VI - 9.--PHYSICAL VOLUME OF SALES OF SHRIMP AND SHRIMP PRODUCTS IN 12 SELECTED RETAIL FOOD STORES IN 4 METROPOLITAN AREAS, FALL OF 1955

(3 Bi-weekly Periods)

(In pounds)



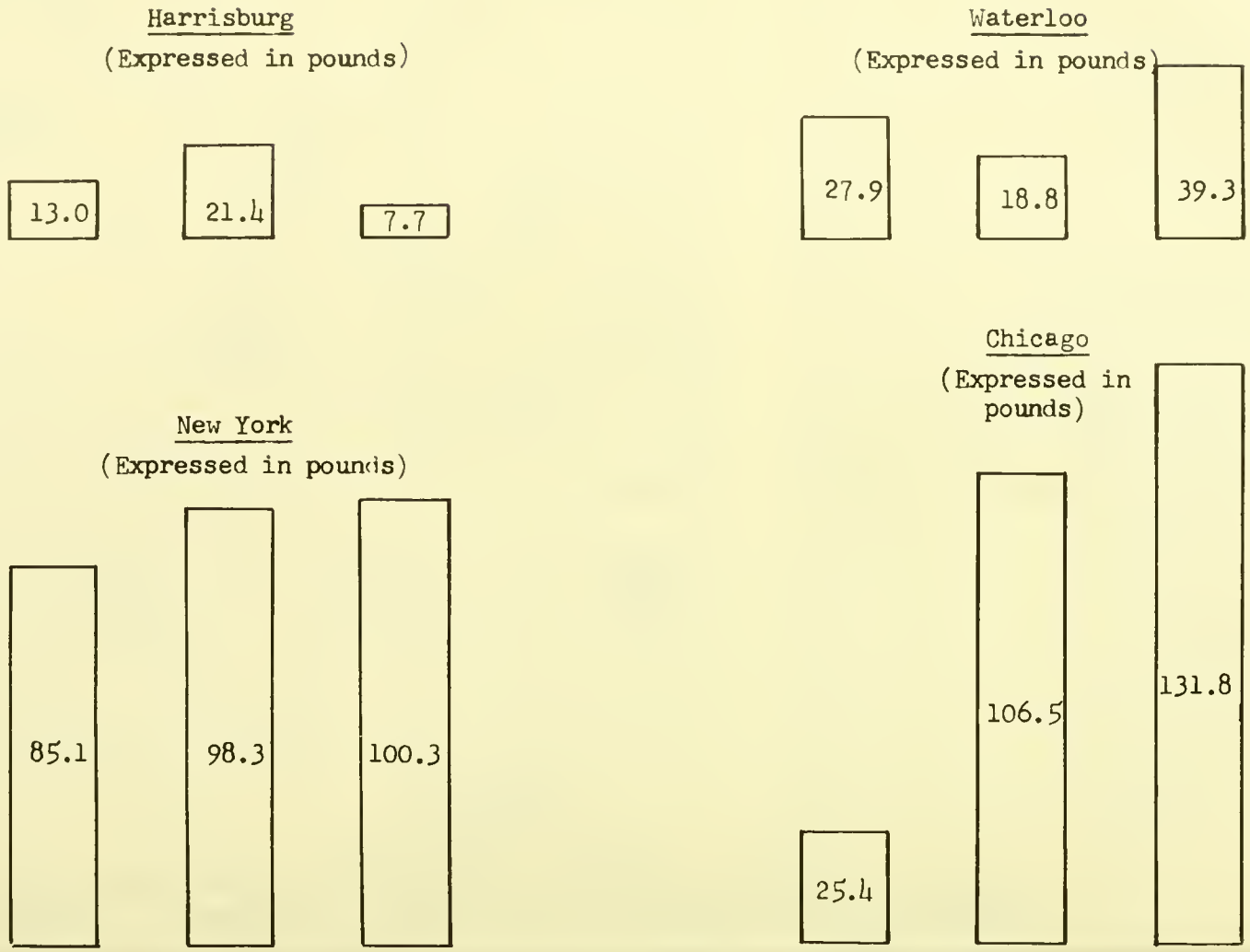
1/ Normal sales activity.

2/ Increased varieties and package sizes.

3/ Increased varieties and packages sizes plus point of sale advertising.

FIGURE VI - 10.--PHYSICAL VOLUME OF SHRIMP AND SHRIMP PRODUCT SALES IN 12 RETAIL FOOD STORES BY METROPOLITAN AREA, FALL OF 1955

(3 Bi-weekly Periods)



Retailers' Practices

At the time of the October 1, 1955 audit of operations the 281 retailers participating in the Nielsen Company survey were interviewed by the company's field investigators in regard to their attitudes and practices in the marketing of shrimp and shrimp products. A total of 255 stores furnished information sufficiently complete to be used in the tabulations of answers to the specially designed questionnaire. The percentages computed on the basis of the questionnaire response are considered by the Nielsen Company as representative for all retail food stores in the country since the sample used was randomized and stratified, providing greater coverage--from a volume standpoint--for chains and large independent stores and proportionately lower coverage for smaller stores.

The subject groupings of the questionnaire and, to a certain extent, the individual questions asked of the retailers, were the same as those in the secondary wholesaler phase of the survey.

Trade Channels

Secondary and primary wholesalers ranked first and second among marketing agents supplying retailers with shrimp products. As many as 36 percent of the stores in the sample obtained the bulk of their shrimp supplies (three-fourths or more of their purchases) from secondary wholesalers, while 13 percent purchased principally from primary wholesalers. Chain warehouses, fish dealers, brokers, frozen food dealers, and shrimp processing establishments, in that order, were next in importance as sources of supply. Table VI - 9 lists the sources of supply for the bulk of retailer purchases of shrimp products as well as of all fish and shellfish products.

TABLE VI - 9.--SOURCE FOR BULK (76-100 PERCENT) OF RETAILERS' PURCHASES OF FISH AND SHELLFISH, AND SHRIMP PRODUCTS, 1955

Source	Percent of stores buying bulk of fish and shellfish from source indicated	Percent of stores buying bulk of shrimp from source indicated
Brokers	.8	2.2
Secondary wholesalers	33.8	36.1
Chain warehouses	5.2	5.0
Primary wholesalers	1.0	13.0
Fish dealers	8.6	3.5
Shrimp processing establishments	(1)	1.0
Frozen food dealers	0.4	1.1
Several sources	50.2	38.1

1/ Less than 1/10 of 1 percent.

Recent Consumer Sales Trends

To obtain some indication of recent trends in consumer sales of shrimp products, the retailers were requested to compare, in an approximate fashion, 1954 to 1953 sales. While almost one-third of the retailers expressed an opinion that they did substantially the same amount of business in the 2 years, 39 percent thought they did better in 1954 than in 1953 as against 24 percent who thought they had fared worse; a small proportion of the retailers interviewed, i.e., 4 percent, were unable to come to a definite conclusion.

Better packaging of products and an increase in demand were the principal reasons given for the pickup in sales in 1954 wherever an improvement over the preceding year was noted. The reasons for improvement cited were:

New shrimp products, such as:
  Breaded shrimp
  Peeled Shrimp
  Shrimp creole
Better packaging
Better refrigeration in storage
Better refrigeration in transit
Improved handling
More variety
Improved distribution
Lower prices
Increased demand
Sale of fresh cleaned shrimp
Large open top display
Improved display
Advertising

For the purpose of determining the relative importance of different shrimp and competitive fish and shellfish products in the retail market, the retailers were asked to rank the following 7 products by volume of sales in their stores: (1) fresh shrimp, (2) packaged frozen headless shrimp, (3) frozen cooked breaded shrimp, (4) frozen uncooked breaded shrimp, (5) frozen lobsters and lobster tails, (6) frozen fish sticks, and (7) frozen scallops. The tabulation of rankings reveals that frozen fish sticks were listed as best-seller by as many as 37 percent of the retailers. Following next, but substantially behind the leader, were packaged frozen headless shrimp, fresh shrimp, and the other frozen shrimp products. (see table VI-10)

TABLE VI - 10.--RETAILERS' RANKING OF SELECTED FISH AND SHELLFISH PRODUCTS IN ORDER OF IMPORTANCE IN THE RETAIL MARKET, 1955

Product	Percent of retailers ranking product						
	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7
Fresh shrimp	14.6	7.2	2.1	1.3	0.8	1.8	4.3
Frozen shrimp	20.0	20.1	17.4	8.7	2.3	-	2.0
Frozen cooked breaded	13.5	13.5	8.3	4.2	2.2	1.8	0.7
Frozen uncooked breaded	12.8	17.9	9.2	5.4	4.1	5.6	-
Frozen lobster and lobster tail	.5	4.5	14.6	4.4	10.9	4.9	1.6
Frozen fish sticks	37.3	18.6	8.1	1.6	4.0	0.4	1.2
Frozen scallops	1.3	8.4	9.0	16.0	4.8	4.1	0.7
No rank given	-	9.8	31.3	58.4	70.9	81.4	89.5

Availability of Product

Eighty-six percent of the stores did not experience any difficulties in having their shrimp orders filled. Lack of availability of the products at wholesale was the principal reason for orders remaining unfilled in those instances when difficulties were experienced.

Complaints about the quality of their purchases were voiced by 15 percent of the stores. They related for the most part to frozen and fresh shrimp. Among the types of complaints listed, by far the most important dealt with the excessive iodine content of the product. Other specific complaints about quality were:

Color not consistent
Breading too heavy

Complaints about the high cost of purchases were made by a small proportion of retailers. Eighty-eight percent of the stores did not experience any difficulty in obtaining all the shrimp they wanted at prevailing prices in the locality in which they were situated.

In general, retailers were not convinced that improvements in processing and packaging of shrimp products would aid sales, even if accompanied by only moderate increases in cost. Over a third of the 255 respondents were unable to come to a definite conclusion on this point, while 35 percent answered in the negative as against 31 percent who expected positive results.

Among suggestions for improvements in processing and packaging of products made by the retailers were the following:

Suggestions for Processing:	Suggestions for Packaging:
Elimination of offensive odors	Packing in layers
Better cleaning	More attractive packages
	Packages better adapted for shipping
	Heavier containers
	Smaller package
	Transparent containers
	Brighter colors on outside wrap
	1-pound instead of 12-ounce packages

Some retailers were of the opinion that demand would respond favorably to a lowering of prices.

Nine percent of the stores were themselves engaged in some kind of processing or packaging activity. Of the stores which were so engaged, 31 percent were freezing fresh shrimp and 42 percent were thawing and repacking frozen shrimp. A few of the stores did some breading.

In answer to questions about storage and marketing facilities available, 86 percent of the retailers thought they had enough cold storage space and 63 percent were satisfied with the extent of display facilities available to them. Nearly two-fifths of the stores stated they had sufficient icing facilities and 46 percent had adequate freezer display facilities.

Suggestions for improvements in display or merchandising which would sell more shrimp, ranked in order of the frequency with which they were mentioned by the retailers, are listed below.

1. Larger freezer display
2. Wider display variety
3. Feature display signs
4. Larger icing display
5. Reduce wholesale price
6. More freezer storage

Distribution Problems

Not all of the shrimp purchased from wholesale sources can be marketed. Over the 18-month period preceding the date of the survey spoilage of product had reduced the saleable inventories of 11 percent of the retail stores, according to information furnished to the Nielsen Company field investigators. Cited as principal causes of spoilage were poor storage facilities and methods, inadequate refrigeration in transit, poor delivery, overstocking, and broken containers.

Prices and Markups

Four out of every five stores had a general price policy for shrimp and all other fish and shellfish products. Approximately two-thirds of the stores with such a policy priced their products by adding a constant markup to cost. Relatively few stores indicated that they either varied the markups depending upon the product, or priced on the basis of suggestions made by salesmen, or charged what the traffic would bear, or allowed discounts to certain types of customers.

When shrimp products were not covered by a general price policy, prices were most commonly changed with the market. Some stores charged varying prices depending on size of shrimp; others used a 30 percent markup on selling price, changed their prices to meet competition or priced according to policies set at chain headquarters.

Over 13 percent of the respondents stated that they changed shrimp prices more often than prices of other fish and shellfish products handled by them. The most important specific reasons given for this were weather conditions and seasonal fluctuations of supply; 56 percent of these retailers, however, were unable to furnish an explanation for this difference in policy.

Changes in wholesale prices and in store operating costs were the most frequently cited reasons for consumer price changes. Changes in demand and in prices of competing products, to judge from the answers to the Nielsen Company questionnaire, exerted a much smaller influence on selling price.

Product Preference and Product Competition

The following characteristics of product and package were considered as having an effect on consumer sales:

1. Size
2. Color of product
3. Freshness
4. Iodoform taste
5. Package size and type
6. Too much breading
7. Peeling
8. Deveining
9. Price

Most important among these factors were size and color of shrimp, with freshness and taste of product following next. The proportion of retailers, on the other hand, who did ascribe special importance to quality characteristics in connection with the marketing of shrimp was rather small.

An idea of consumer preferences for individual shrimp products was obtained by having the retailers rank fresh shrimp and seven processed shrimp products in order of their popularity in the retail market. The ranking which is reproduced below reveals that frozen uncooked breaded shrimp was listed first by 27 percent of the retailers. Fresh shrimp, which was ranked first by 25 percent of the respondents, did poorly as alternate choice. Although packaged frozen headless shrimp was ranked only in fourth place as first consumer choice, it was decidedly the most popular product in the opinion of the retailers when alternate choices were taken into consideration. (see table VI-11)

TABLE VI - 11.--RETAILER RANKING OF CONSUMER PREFERENCE FOR SHRIMP PRODUCTS, 1955

Product	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7	Ranked 8
	(Percent of retailers ranking product)							
Fresh	24.8	2.6	4.3	3.6	1.1	1.5	0.4	-
Frozen	18.7	36.5	15.4	12.3	3.2	-	-	-
Cooked breaded	22.6	17.1	11.2	3.4	-	-	-	-
Uncooked breaded	27.1	19.3	9.8	3.4	3.0	1.3	-	-
Sticks	2.4	0.9	3.2	2.7	1.8	2.2	1.9	-
Creole	-	1.5	0.6	2.0	2.4	3.1	3.1	1.5
Cocktail	3.1	8.9	12.1	4.9	3.5	2.2	2.3	-
Canned	1.3	1.8	-	-	-	-	-	-
No rank given	-	11.4	43.4	67.7	85.0	89.7	92.3	98.5

In answer to a question probing for suggestions for additional shrimp products for which a market could be developed, retailers mentioned the following specialties: smoked shrimp, frozen cooked shrimp, bait shrimp and boiled peeled shrimp.

Fish sticks, canned salmon and tuna products, and frozen fish and meats were most frequently mentioned as important protein sources in competition with shrimp products. The tabulation of questionnaire responses shown in table VI - 12 indicates that as many as 37 percent of the retailers listed fish sticks among the most competitive products, whereas the proportions of respondents listing canned fish and frozen fish and meats were in the 25 to 30 percent range. For comparison purposes, the corresponding secondary wholesaler estimates, as determined from the response to the wholesaler questionnaires, are shown alongside the retailer percentages.

TABLE VI - 12.--FOOD PRODUCTS IN COMPETITION WITH SHRIMP PRODUCTS (PROPORTIONS OF SAMPLE OF RETAILERS AND SECONDARY WHOLESALERS LISTING EACH), 1955

Product	Percent of retailers listing product	Percent of wholesalers listing product
Fish sticks	37.3	41.3
Canned salmon	28.6	13.2
Frozen fish	26.5	47.1
Frozen meats	26.4	5.8
Canned tuna	26.2	19.0
Fresh fish	23.3	24.0
Scallops	21.4	31.4
Fresh meats	20.6	13.2
Tuna pies	19.9	7.4
Cheese	18.6	2.5
Lobsters	15.6	28.9
Eggs	10.7	5.8
Oysters	1.4	-
Crabmeat	1.2	4.1

According to the retailers who felt qualified to express an opinion an increase in packaged frozen headless shrimp sales of 25 percent would not materially affect the sale of other shrimp products.

Nearly one out of every four stores promoted other fishery products more intensively than shrimp. In particular, these fish and shellfish products, in order of the frequency with which they were mentioned by the respondents, were:

Frozen fish	Locally caught fish
Fresh fish	Oysters
Tuna	Clams
Fish sticks	Crabs
Salmon	Smoked fish

In contrast with the above, more than one-fourth of all respondents indicated that they made special efforts to promote shrimp products. These efforts related to special window signs, bigger displays, newspaper advertisements, delivery service as well as special sales at lowered prices and joint promotion with other retailers.

Joint promotion with other retailers was listed as the most promising means for boosting sales of shrimp. Other changes in marketing methods which were considered helpful from a promotional angle were: more attractive packaging, addition of more packages one pound or smaller and of new specialty products to the line, additional display facilities, and increased advertising.

The types of sales promotion for shrimp products used by retailers, and the percentage of retailers using each type, are listed below. Promotion in local newspapers, store features, and the distribution of leaflets were by far the most important means of featuring the sale of shrimp products. With the exception of a small fraction of outlets there was rather general agreement that stepped-up advertising would benefit demand. (see table VI-13)

TABLE VI - 13.--TYPES OF PROMOTIONAL ACTIVITY ENGAGED IN BY RETAIL FOOD STORES HANDLING SHRIMP AND SHRIMP PRODUCTS, AND PERCENT OF STORES IN SAMPLE LISTING EACH ACTIVITY, 1955

Type of promotional activity	Percent of stores listing
Local newspaper	46.7
Store feature	44.9
Leaflets	22.6
Verbal promotion	11.6
Brand name	8.3
Local TV	8.0
Local radio	5.2
Coupons	3.7
Wholesale allowance	3.5
House to house	2.0
Retailer brand	0.7

Retailer preferences in featuring shrimp and competitive fish and shellfish products are ranked in table VI - 14, Part A. Part B of this tabulation lists preferences in size of package together with reasons given for these preferences.

TABLE VI - 14.--RETAILERS' RANKING OF THEIR PREFERENCES FOR FEATURING SHRIMP AND SELECTED OTHER FISH AND SHELLFISH PRODUCTS, 1955
Part A

Product	Ranked 1	Ranked 2	Ranked 3	Ranked 4	Ranked 5	Ranked 6	Ranked 7	Ranked 8
	(Percent of retailers ranking product)							
Fresh shrimp	13.7	3.5	2.8	0.9	0.7	0.9	0.2	1.7
Frozen shrimp	20.1	16.9	8.1	6.9	1.9	-	1.7	-
Cooked breaded	15.6	7.4	9.2	2.3	1.9	0.1	-	-
Uncooked breaded	11.7	18.7	6.1	4.4	-	2.0	0.2	-
Specialty	1.7	3.5	5.1	2.0	1.6	2.9	2.1	-
Fish sticks	28.2	14.7	3.8	3.5	3.8	0.1	-	-
Tuna pies	3.5	8.4	6.4	9.7	9.0	2.0	0.2	-
Cooked and peeled shrimp	0.2	-	-	-	-	-	-	-
Canned shrimp	1.8	0.4	-	-	-	-	-	-
Fresh fish	1.5	-	-	-	-	-	-	-
Frozen fish	1.9	-	-	-	-	-	-	-
Broken shrimp	0.1	-	-	-	-	-	-	-
Unranked	-	26.5	58.5	70.3	81.1	92.0	95.6	98.3

TABLE VI - 14.--RETAILERS' PACKAGE SIZE PREFERENCES FOR FISHERY PRODUCTS AND REASONS STATED FOR SUCH PREFERENCES, 1955

Part B

(In order of importance)

Frozen shrimp	16 oz.	Cheaper and convenient Customer preference
	12 oz.	Easy to handle Suits more families Good consumer value
Cooked breaded shrimp	10 oz. 12 oz. 16 oz.	Customer preference Suits more families Customer preference
Uncooked breaded shrimp	12 oz. 16 oz. 10 oz.	Cheaper and convenient Larger package best Customer preference easy to handle
Specialty shrimp	5 and 6 oz. 12 oz.	Easy to handle Suits more families
Fish sticks	10 oz.	Good consumer value Customer preference
	12 oz.	Good consumer value Easy to handle Cheaper and convenient
	8 oz.	Customer preference Better markup Good consumer value
	16 oz.	Larger package best
Tuna pies	10 oz. 6-7-8 oz.	Good consumer value Customer preference
Cooked and peeled shrimp	16 oz.	Do not like to clean
Canned shrimp	5 oz.	None given
Fresh fish		None given Better markup
Frozen fish	16 oz.	Cheaper and convenient
Broken shrimp	10 oz.	Cheaper and convenient

At the time the Nielsen Company survey was made only a small fraction of retail outlets had participated in, or had been aware of, advertising campaigns conducted in connection with the sale of shrimp products. Those retailers who knew of such a campaign believed, in the majority, that it represented a joint effort of wholesalers and retailers. They named hand bills, newspaper and trade magazine advertisements, recipe books, radio commercials, sample menus, and group advertising, as principal features of such campaigns. Most retailers considered campaigns of this sort effective.

Only 4 percent of the retailers had joined wholesalers in the promotion of shrimp products at some time during the 18 months preceding the survey. The features of joint promotions which in the opinion of the retailers would bring the best results were, in order of importance: lower prices, television advertising, freezer cabinet displays, and multiple pricing.

The last item in the retailer questionnaire sought to elicit an opinion concerning the factors influencing shrimp consumption. Ranked in order of importance the factors cited by the retailers were:

1. Lower prices
2. Higher incomes
3. Working wives (a factor contributing to the demand for readily prepared foods)
4. Easy to prepare
5. Restaurant consumption
6. Quality
7. Good consumption during winter
8. Pleasant taste
9. Fast days
10. Good with beer

SELECTED REFERENCES

Burke, F. X.
1931 Profit possibilities in quick frozen shrimp. Fishing Gazette, vol. 48, no. 2, February.

Clifford, D. M.
1955 Marketing and utilization of shrimp in the United States. Proceedings of the Indo-Pacific Fisheries Council, 6th Session, Tokyo, Japan, October 14.

Kahn, R. A. and Stolting, W. H.
1955 Household consumer preferences for breaded shrimp and breaded fish sticks. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 424, Part 1).

Household consumer preferences for breaded shrimp and breaded fish sticks. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 425, Part 2).

1956 Household consumer preferences for breaded shrimp and breaded fish sticks. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 426, Part 3).

1939) Sales patterns for fresh and frozen fish and shellfish.
1946) United States Department of the Interior, Fish and Wildlife
1949) Service, Washington, D. C. (Fishery Leaflet 365)

Kuhn, Gil
1951 How a California firm markets nine million pounds of shrimp. Quick Frozen Foods, vol. 13, no. 7, pp. 46-47.

A. C. Nielsen Company
1955 A brief description of Nielsen food index and Nielsen drug index. Chicago, Illinois.

Quick Frozen Foods
1955 Convenience, menu versatility spur growth of peeled and deveined shrimp. Vol. 18, September, p. 91.

Slavin, J. W. and Heerdt, M.
1956 Distribution and marketing of frozen fishery products. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 431)

Southern Fisherman
1949 Ready-to-sell shrimp cocktails. Vol. IX, no. 8, pp. 43, 99.

Stolting, W. H. and Garfield, M. J.
1952 Fish and shellfish preferences of household consumers - 1951, Part II - Regional summary. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 408)

1954 Fish and shellfish preferences of household consumers - 1951, Part III - Summary by income groups. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 409)

Stolting, W. H. and Alexander, D. R.
1954 Fish and shellfish preferences of household consumers - 1951, Part IV - Summary by farm, nonfarm, and city-size groups. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 410)

Toney, Tom
1952 And now it's shrimp drive-ins. Seafood Business, vol. 5, no. 4, p. 18.

United States Fish and Wildlife Service
1954 Fresh and frozen fish buying manual. United States Department of the Interior, Washington, D. C. (Circular 20)

CHAPTER VII

SPECIAL ASPECTS OF MARKETING

ABSTRACT

PACKAGING, STORING, AND SHIPPING OPERATIONS CONSTITUTE IMPORTANT PHASES OF THE DISTRIBUTION PROCESS.

ADEQUATE PROTECTIVE COVERING IS REQUIRED TO PREVENT UNDESIRABLE CHANGES IN FISHERY PRODUCTS DURING PERIODS OF STORAGE. APPEARANCE OF PACKAGES IS IMPORTANT FROM THE STANDPOINT OF EFFECTIVE SALES PROMOTION. PACKAGE DESIGNS TODAY MUST FUNCTION AS EYE CATCHERS AND HELP IN THE MARKETING OF THE PRODUCT. THE COVERINGS USED FOR THE PACKAGING OF FROZEN SHRIMP AND OTHER FISHERY PRODUCTS INCLUDE GLAZES, FILMS AND WRAPS, PACKAGES, CARTONS, AND OVERWRAPS. THE STANDARD CAN SIZE FOR CANNED SHRIMP PRODUCTS IS THE 8 Z SHORT (211 X 300) CAN WHICH HAS A DRAINED WEIGHT CONTENT OF FIVE OUNCES OF SHRIMP MEAT.

FRESH AND FROZEN SHRIMP, BECAUSE OF THEIR PERISHABLE NATURE, MUST BE REFRIGERATED FROM THE TIME THE CATCH IS HAULED ON BOARD THE BOAT UNTIL THE SHRIMP DISH IS PREPARED FOR THE TABLE. PUBLIC AND PRIVATE COLD STORAGE FACILITIES FOR SHRIMP HAVE EXPANDED SUBSTANTIALLY IN THE PAST DECADE, BOTH AT PRODUCTION AND DISTRIBUTION POINTS. WITH THE GROWING POPULARITY OF SHRIMP AMONG CONSUMERS, RETAILERS HAVE SHOWN A WILLINGNESS TO ALLOT SHRIMP PRODUCTS ADDITIONAL FROZEN STORAGE AND DISPLAY SPACE. THE MODERN KITCHEN, EQUIPPED WITH AMPLE FROZEN STORAGE SPACE IN REFRIGERATORS AND HOME FREEZERS, HAS ENABLED THE HOUSEWIFE TO STORE AND FREEZE SHRIMP SPECIALTY PRODUCTS IN ADDITION TO FROZEN FOOD STAPLES.

AS ADEQUATE STORAGE FACILITIES BECOME AVAILABLE AT ALL POINTS IN THE PRODUCTION, PROCESSING, AND DISTRIBUTION CHAIN, QUALITY CONTROL IS FACILITATED. SINCE POTENTIAL DAMAGE AS THE RESULT OF ACCIDENTALLY MARKETING SPOILED PRODUCTS IS GREAT, QUALITY STANDARDS AND QUALITY CONTROL HAVE BECOME SUBJECTS OF MAJOR AND CONSTANT CONCERN IN THE INDUSTRY. RESEARCH IS DIRECTED TOWARD FINDING RELIABLE QUALITY INDEXES, NEW METHODS OF RETARDING BACTERIAL ACTION, AND PRESERVING TEXTURE AND FLAVOR DURING PROCESSING AND STORAGE.

WITH THE RISE IN DEMAND FOR FROZEN SHRIMP, REFRIGERATED MOTOR TRUCKS HAVE GROWN STEADILY IN IMPORTANCE AS A MEANS OF TRANSPORTING AND DISTRIBUTING THE PRODUCT. TODAY NEARLY ALL RECEIPTS IN LARGE METROPOLITAN MARKETS SUCH AS NEW YORK CITY AND CHICAGO ARE BY REFRIGERATED TRUCKS. THE RAILROADS PLAY A SIGNIFICANT ROLE IN THE SHIPMENT OF CANNED SHRIMP AND RAILWAY EXPRESS AGENCY, INC. HAS A SUPPLEMENTARY PART IN THE TRANSPORTATION OF VARIOUS KINDS OF SHRIMP PRODUCTS, PARTICULARLY FRESH AND FROZEN.

PACKAGING

The meteoric rise in recent years of the quick-frozen foods industry has been accompanied by important developments in the field of packaging research. The seafood branch has benefited at least as much from the technical advances made as any other segment of the food industry.

If not provided with some form of protective coating or covering, frozen fishery products will undergo undesirable changes during periods of storage. Among these changes are flavor loss, toughening, dehydration, and rancidity.

In the early days of freezing and frozen storage, suitable wrapping materials were lacking. Probably the first "package" that came into general usage was the ice glaze that is formed by dipping frozen fishery products in cold water.

Technological Aspects

The types of coverings, not counting master cartons, that are currently used in the freezing segment of the industry can be classified into these basic categories: glazes, films and wraps, packages, cartons, and overwraps. A study published in 1956 by the United States Fish and Wildlife Service, Factors to be Considered in the Freezing and Cold Storage of Fishery Products (Fishery Leaflet No. 429), contains a detailed discussion of these packaging materials. The following comments on coverings abstracted from this source pertain to all frozen fishery products (including shrimp).

Package Coverings

Glazes.--Glazes have been defined as any continuous thin film or coating that adheres closely to the product. The glaze is usually applied on the frozen product by either dipping or by spraying it with a solution of the glazing agent and allowing the glaze to solidify. Among the desirable properties of a glaze for frozen fish are (1) non-cracking, (2) strength to withstand the rigors of handling and shipping, (3) low water vapor pressure to minimize evaporation of glaze, (4) light weight and low bulk, and (5) attractive appearance.

Although many types of glazes for fishery products have been introduced, the ice glaze remains the only one of commercial importance. It is formed when frozen fish are given a short dip in cold water or are sprayed with water which freezes into a thin coating of ice.

The chief disadvantages of the ice glaze are its susceptibility to cracking, its brittleness, and its high vapor-pressure which necessitates reglazing if the product is stored for any length of time. Its

advantages far outweigh its disadvantages, however. The ice glaze is inexpensive, easy to apply, readily adaptable to a production line, and provides a satisfactory protective covering for a variety of fishery products. When properly applied and maintained, the ice glaze is effective in preventing loss of moisture from the product as well as preventing ready access of air to the fish, thus retarding the onset of rancidity.

Among other types of glazes which have been tried on an experimental scale but so far have not replaced ice glazing on a commercial scale are pectinate films, gelatin-base coatings, waxes, edible oils, and combinations of chemicals and Irish moss extractive.

Films and wraps.--Films and wraps make up another class of protective coverings for frozen fish. There are a large number of films, foils, resin-coated papers, lacquered papers, waxed papers, plastic-coated papers, and various combinations of laminated papers on the market. Each has its own set of characteristics. The choice of the packaging material is governed by such factors as the protection requirement of the frozen product, the cost of the packaging material, the cost of the packaging operation, and its merchandising features. In general, it can be said that a good wrapping material for frozen fish should be strong enough to resist tearing and puncturing from handling during the packaging operation, pliable enough to make a tight wrap, easily sealable, greaseproof, and durable at low temperatures. It should impart no odors or flavors and should have a low rate of moisture-vapor and oxygen transmission.

Among the more commonly used wrapping materials for frozen fish are cellophane, polyethylene, aluminum foil, vinylidene chloride, rubber hydrochloride film (plio-film), as well as a variety of coated papers such as waxed paper, vinyl- and saran-coated papers, polyethylene-coated paper, and polyethylene-coated cellophane. To improve the keeping quality of foods antioxidants are often incorporated into the paper wrappers.

Packages and cartons.--Packages and cartons used in the industry today have been developed in order to fit them into production-line procedures. The rectangular container made of waxed paperboard is the most widely used in the industry.

Very little has been done in standardizing containers for frozen fishery products. Containers vary as to types of materials, styles, shapes, and sizes, depending upon the product to be packaged and the desires of the producer.

Frozen-food cartons are usually made of a bleached paperboard stock and are coated with various waterproofing materials or else they are laminated with foil or moisture-vapor-resistant film. The coating material may be an improved wax formula, polyethylene, or some other plastic material. The hinged-cover, self-locking carton coupled

with moisture-vapor-proof, heat-sealable overwraps is widely used. Some cartons have covers with a cellophane window to display the contents of the package but because of the high incidence of breakage the trend is away from this type of package.

Self-locking cartons are made in two general sizes, consumer and institutional. The consumer sizes range from about 3 ounces to about 2-1/2 pounds. The more expensive products, such as shellfish meats, are generally packaged in sizes from 3 to 12 ounces. Institutional packs generally come in 5-, 7-1/2-, 10- and 20-pound sizes.

Trays made of molded pulp are now widely used for prepackaged meat products and, to a smaller extent, for some fishery products, such as small fish, fish steaks, and fish sticks. One form of tray consists of a sheet of paperboard with its four sides folded at right angles and fastened together at the corners. Two trays may be used to form the top and bottom of a complete telescope-type box. The filled tray is overwrapped with a transparent film which is heat-sealed. The trays are sometimes lacquered to provide a high gloss.

Metal cans have not been used to any extent to date in the packaging of frozen foods. The need for a distinctive package to differentiate the product from canned or heat-processed foods is probably the principal reason for this. Tests recently conducted at the Seattle laboratory of the United States Fish and Wildlife Service have shown that fish frozen and stored in evacuated tin cans maintain their quality much better than in other packaging materials. Changes in flavor and color are almost eliminated. Among the advantages cited for packing frozen fish in tin cans are (1) higher quality fish, (2) availability in packaged frozen form of species not hitherto handled in the frozen state, e.g. pink salmon, and (3) labor saving in preparation and packaging through the use of high-speed can-handling equipment. Possible disadvantages to this method of packaging frozen fish are (1) spoilage hazards from improper storage, (2) difficulty of freezing round cans in existing plate-type freezers, and (3) the usual mechanical fish-can fillers cannot be used if the fish are processed in the form of fillets or steaks.

Another form of the metal package is a semi-rigid aluminum container or pan package. By using aluminum-pan packages producers of prepared fish dinners can package their products so that the housewife can prepare and serve the dinner without removing the fish from its original container. A pan package is made of a sheet of heavy aluminum foil that is stamped or folded into a pan shape. The packages, made in the form of trays, dishes, and plates, are generally tapered so that they will nest for storage and are available with printed lids or without lids if a transparent overwrap is to be used. When used for frozen foods they are generally placed in individual, rectangular cartons for added protection during distribution.

Outside wrappers or overwraps.--Outside wrappers or overwraps are used to properly close and seal paperboard containers. Tests have shown that a waxed paperboard carton without a moisture-retardant overwrap has a considerably higher rate of water vapor loss than one with a good overwrap. In addition to providing added protection against desiccation of the frozen product during long periods of storage, an overwrap protects against wear and tear that normally is to be expected during distribution and against contamination during handling and storage. It tends to hold the package together and enables it to better withstand rough handling.

Overwraps, to meet the requirements for food packaging, must be non-toxic, tasteless, and odorless; must prevent loss of moisture; have low gas-transmission rates; be tough, flexible, and durable under conditions of shipment, storage, and marketing; have adequate stiffness and slip (ability to slide freely so as to be wrinkle-free) to permit convenient and economical handling on high-speed printing and wrapping equipment; be durably printable; and make an attractive package.

The materials most widely used as overwraps probably are cellophane and waxed paper. Other materials used are aluminum foil, rubber hydrochloride, polyethylene, and polyvinylidene chloride.

Master Cartons

The individual packages of frozen shrimp are placed in large master or shipping cartons for frozen storage and shipment. These containers are generally made of corrugated fiberboard, which is strong but light in weight, and possessing good insulating qualities. Layout and color coordination between the individual cartons and the shipping containers provides better product identification and utilizes the container to further advertise the product. Certain requirements relating to the strength (pound test) of the fiberboard, maximum weight of contents for a particular size carton, and other factors, must be complied with if the carton is to be used for shipment. Corrugated fiberboard shipping containers must also comply with carrier regulations. The fiber-box industry has standards that deal with terminology, correct style names, and proper order of dimension that have been in general use.

The number of cartons placed in a shipping container varies but, in general, will be 12 or 24 for cartons of a pound or less. With larger-size cartons, such as those holding 5 or 10 pounds, the shipping container usually holds a total of 50 pounds. Containers made of solid fiberboard furnish less insulation than those made of corrugated material and are not considered to be as suitable for frozen foods.

Several types of specially insulated containers for shipping frozen foods are currently available on the market. Because of their cost these containers must be returned for re-use after each shipment.

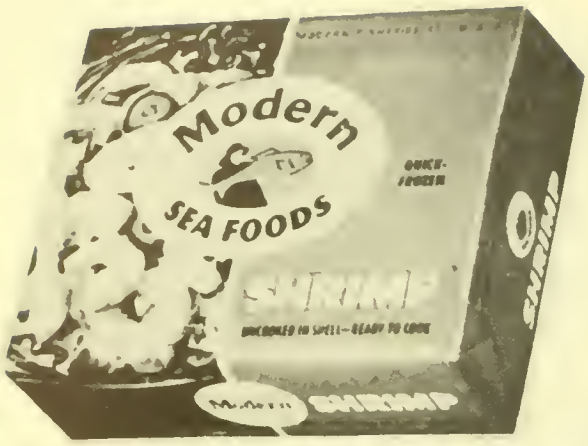


FIGURE VII - 11.--Waxed and cellophane overwraps of shrimp packages.

National Fisheries Institute, Yearbook, 1951.

Wrapping Machinery

Together with the advances in packaging materials research, great strides have also been made in the development of machinery for wrapping packaged frozen foods. Volume of production has been increased, while production costs actually have gone down. Today's machines, which have wrapping speeds of up to 150 packages per minute, may generally be adjusted to accommodate packages of any one of several combinations of dimensions and are usually adaptable for the use of practically any type of wrapping material. Electric eye-type registering devices are available that accurately center the printed design on the carton.

General Considerations in Package Selection

Packages must sell as well as protect. Because of the variety of products on the market, package legends must clearly describe the contents. The good package should have genuine appetite and eye appeal. The inclusion of recipes for preparation of the product is a valuable aid to sales.

The label is of great importance from a selling standpoint and is at the same time a legal document. The following standard requirements are set up by State or Federal statutes for labels: All foods must be labeled with their common or usual name; the label must not be misleading in any way; under certain conditions it is compulsory that specific declarations be made, i.e., some products are "defined" and do not require a list of ingredients on the label, others are "not defined" and must list all ingredients in descending order of their proportionate part of the total contents; the presence of artificial coloring or flavoring and chemical preservatives must be stated; the net contents of the container must be shown in uniform terms; the name and address of the manufacturer, packer, or distributor must also be shown.

Cartons of several sizes are used for frozen uncooked shrimp, such as the 8-, 10-, and 12-ounce consumer-type waxed carton with overwrap and 1-pound tray-type cardboard carton with transparent overwrap, and the institutional sizes of 2-1/2, 5, or 10 pounds. Glazing of shrimp in the large-sized cartons is inadequate, because the glaze evaporates at the edges of the block during frozen storage and the shrimp become desiccated. A more recent method that is being used rather widely omits the glazing entirely and relies on a moisture-vapor-proof overwrap to prevent dehydration of the shrimp.

Canned Pack Sizes

The bulk of canned shrimp is packed in brine (wet pack). An insignificant proportion is dry-packed. Most shrimp canners pack a variety of can sizes, among them 4-1/2-, 5-, and 6-3/4-ounce consumer cans

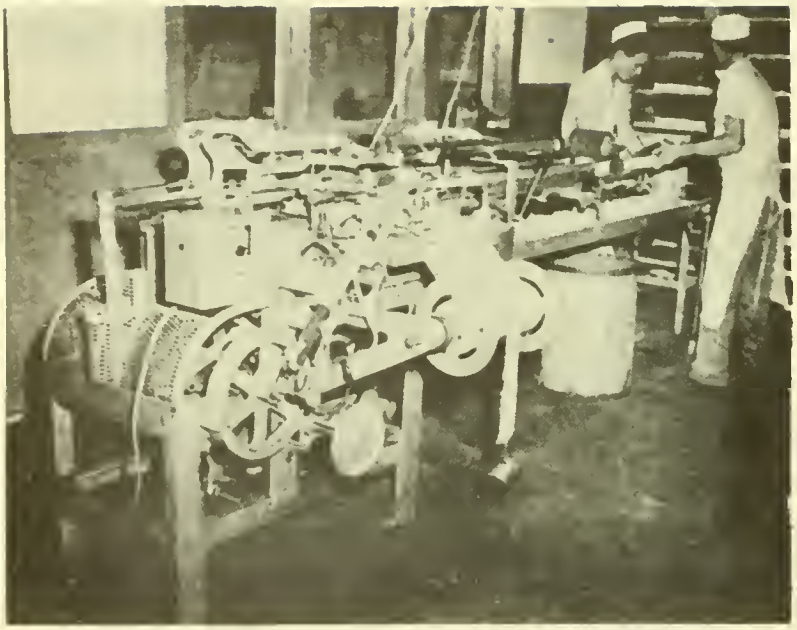


FIGURE VII - 12.--Overwrap machine in operation at a Dallas plant.

Southern Fisherman, July 1955.

and No. 5 institutional cans. The accepted standard can size for the industry is the 8Z short (211 x 300) can which has a drained-weight content of five ounces of shrimp meat.

Although small shrimp are highly adaptable to the canning process, consumer preferences at times force the canneries to emphasize larger varieties. Size standards for canning developed by the industry are as follows:

Colossal . . . less than 2-1/2 shrimp to the ounce.
Jumbo. . . . . less than 3-1/2 shrimp to the ounce.
Large. . . . . 3-1/2 to 5 shrimp to the ounce.
Medium . . . . more than 5 but not more than 9 shrimp to the ounce.
Small. . . . . more than 9 but not more than 17 shrimp to the ounce.
Tiny . . . . . more than 17 shrimp to the ounce.

The descriptive size classification of the shrimp is usually specified on the label; the larger shrimp bring a premium price.

STORAGE

One of the paramount elements in the making of an efficient distribution system is the availability of adequate and safe storage space. In the marketing of fishery products the use of storage capacity enables the industry to equate seasonal demand with seasonal supply. Access to cold storage facilities has become of crucial importance to all segments of the industry as a growing proportion of the total catch of fish and shellfish is being marketed in the frozen form.

Cold storage plants fall into two categories, i.e., public and private establishments. Of the two, public cold storage plants handle by far the larger volume. This is explained by lack of capital which prevents a large number of processors and wholesalers from establishing storage facilities of their own. Storage in public refrigerated warehouses is more economical, since utilization of capacity is ordinarily higher than in the private facilities. Warehouse receipts against merchandise stored in the public storage facility are valuable from a financing standpoint for, since public warehouses are bonded, borrowing on inventory is facilitated for the title holder of the goods. Seasonal fluctuations in shrimp catches make it impossible for the producer to depend exclusively on the public facilities with which he is accustomed to deal. Some public warehouses are unable to provide all of the storage capacity needed during peak production. Agreements are usually worked out under which shrimp are held in public cold storage only until a full truck load is accumulated, at which time the shrimp are moved to cold storage plants farther inland near the large consumer markets.

FIGURE VII - 13.--Canned shrimp - featuring both labels and direct printing.

National Fisheries Institute, Yearbook, 1951.

Fishery products received from truckman to be frozen.

Removal of packages from flats to trays.

FIGURE VII - 14.--Incoming products for freezing.

National Fisheries Institute, 1950. Courtesy of the National Association of Refrigerated Warehouses.

Cabinets being hauled into freezing compartments.

Pans of fresh fish on shelf freezers.

FIGURE VII - 15.--Freezing compartments.

National Fisheries Institute, 1950.
Courtesy of the National Association of
Refrigerated Warehouses.

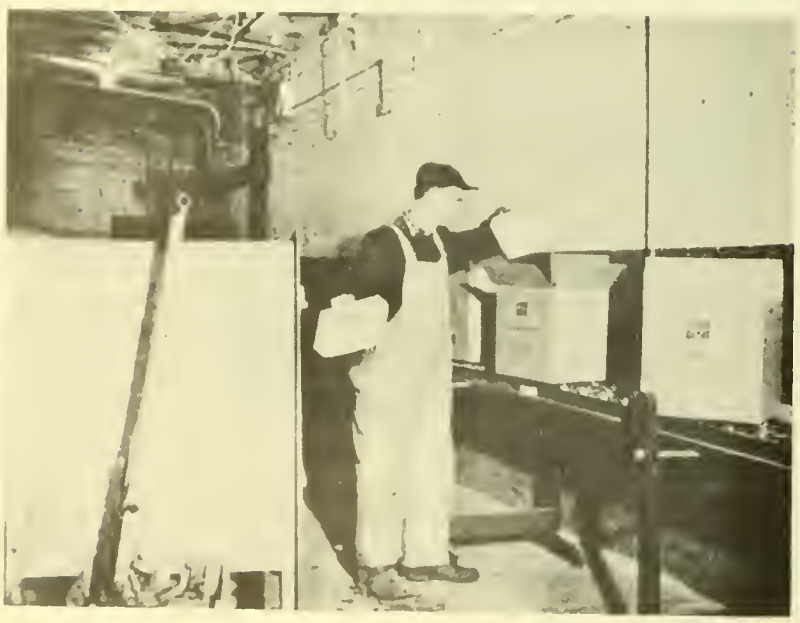
Blocks of panned fish stored in storage room.

Boxes of fish being frozen on shelf freezers.

FIGURE VII - 16.--Boxes and blocks of fish in storage room.

National Fisheries Institute, 1950. Courtesy of the National Association of Refrigerated Warehouses.

Man with fork truck stacking pallet loads of master cartons in storage room.



Packages packed into master cartons.

FIGURE VII - 17.--Packing and loading.

National Fisheries Institute, 1950.
Courtesy of the National Association
of Refrigerated Warehouses.

Boxes stacked in storage room after freezing.

Stocking master cartons in a low ceiling room.

FIGURE VII - 18.--Storage.

National Fisheries Institute, 1950.
Courtesy of the National Association
of Refrigerated Warehouses.

In addition to providing storage space, the public freezer in the producing area frequently will perform other services for its customers. As already mentioned, the freezer may perform all the processing operations for the shrimp plant and prepare the product for the consumer market. The public facility, in contrast to the shrimp freezing plant, does not take title to the shrimp it freezes but performs all functions on a fee basis.

Storage of the canned product is usually handled by the cannery itself. Many of the canneries are bonded as "field warehouses". The canneries allocate space to be used for warehousing in accordance with their needs. The shelf-life of canned shrimp can be increased by maintaining storage temperatures at 40° F. to 70° F.

Storage Life

Storage life of shrimp apparently varies with differences in processing procedure. Experiments conducted at Louisiana State University (Fieger, 1948) established that the storage life of samples of frozen Gulf Coast shrimp was as follows:

Item	Storage limits
Shrimp stored without glaze or overwrap	7-9 months
Shrimp stored with glaze or with overwrap	longer than 12 months

Studies with shrimp of the Pandalus family, conducted by the Canadian Fisheries Research Board Laboratory in Vancouver, B. C., resulted in the following recommendations with respect to storage limits:

Item	Storage limits
Shrimp, cooked, peeled, blanched, canned and frozen	3 months
Shrimp, cooked, peeled, blanched, canned, topped with water and frozen	longer than 12 months
Shrimp, cooked, picked, blanched, canned and frozen	4-6 months

Statistics on Cold Storage Holdings

Statistics on cold storage holdings of shrimp for the last of each month have been tabulated for the years 1940, 1945, and 1950-1958 (see table VII - 15). These data are for companies reporting on their holdings to the United States Fish and Wildlife Service; they represent the major portion but not all holdings of shrimp in the United States.

Average holdings (as represented by the arithmetic means of the 12 end-of-month figures) rose from 3.3 million pounds in 1940 to a peak of 25.0 million pounds in 1958, as shown in table VII - 15. This increase reflects both the rising popularity of the frozen product as well as the growth in cold storage capacity over the period. The unusually large inventories recorded for the last few months of 1953 and

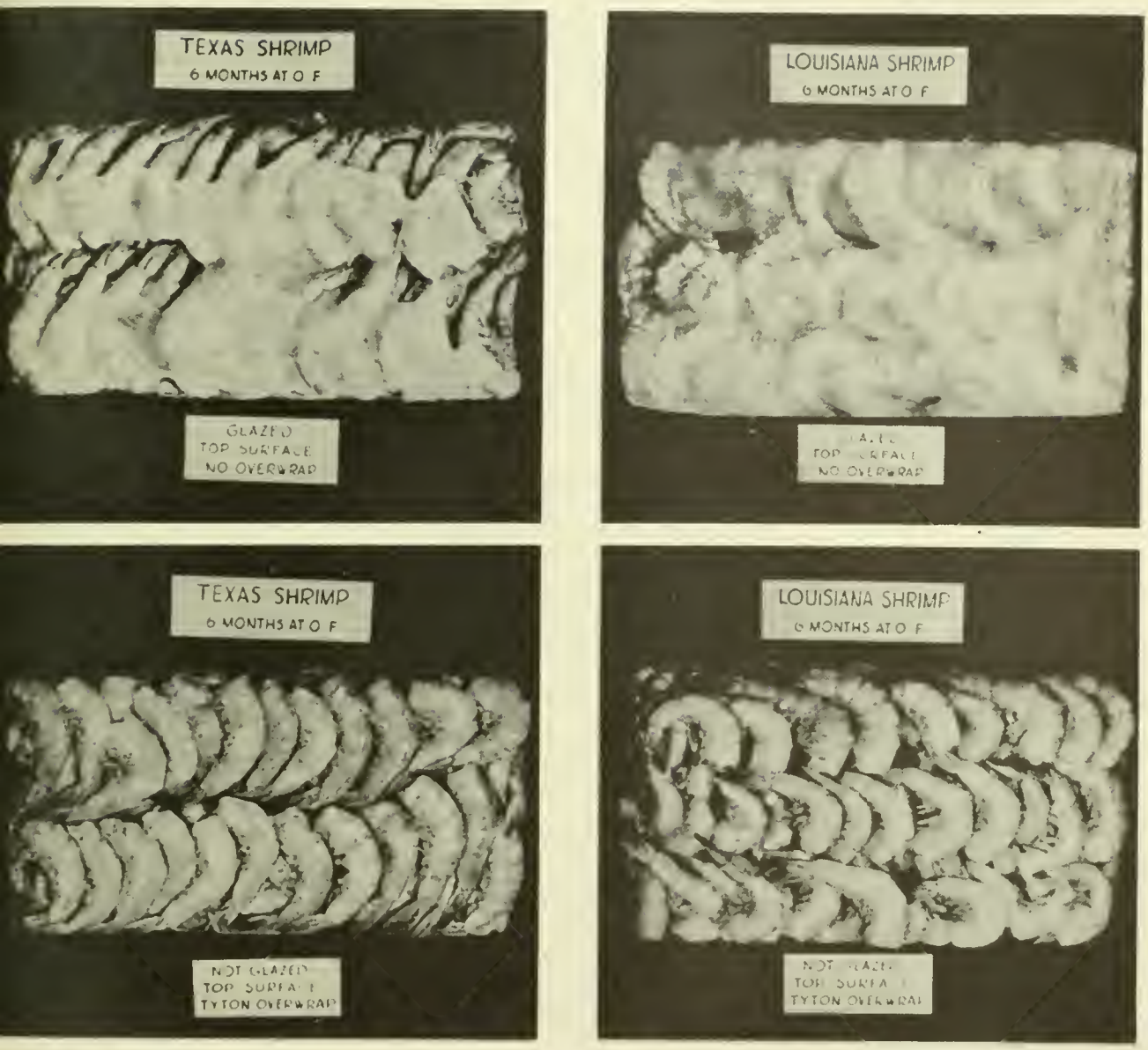


FIGURE VII - 19.--Frozen shrimp appearance after 6 months storage.

National Fisheries Institute, Yearbook, 1953.

TABLE VII - 15.--END-OF-MONTH COLD STORAGE HOLDINGS

FOR SHRIMP, SPECIFIED YEARS, 1940-1958

Month	1940 1/	1945 2/	1950 2/	1951 2/	1952 2/	1953 2/	1954 2/	1955	1956	1957	1958
	(Thousands of pounds)										
January	3,507	9,010	15,703	24,111	26,688	13,183	25,753	28,490	27,220	20,645	26,528
February	3,051	6,631	15,044	22,129	23,021	10,356	24,986	22,666	26,507	19,121	22,248
March	1,904	4,078	13,154	19,159	19,682	7,506	22,508	19,132	23,217	15,313	20,545
April	2,125	2,671	12,379	17,310	16,405	5,960	19,912	15,959	16,037	13,923	18,327
May	2,091	2,828	15,956	15,839	15,469	7,652	18,772	12,549	13,044	13,077	16,373
June	3,692	2,457	16,617	15,802	15,836	9,381	17,489	12,513	11,579	11,038	16,220
July	2,776	2,080	16,389	14,828	14,109	11,693	17,217	16,064	12,812	14,672	18,574
August	1,510	4,010	16,558	15,149	12,547	12,860	20,632	17,697	13,168	17,178	20,838
September	2,085	8,470	17,802	16,568	12,437	14,823	25,117	18,544	16,502	22,995	25,210
October	3,635	13,332	22,756	22,382	14,395	20,962	28,439	22,423	20,477	28,896	32,721
November	5,801	16,001	24,585	26,459	16,384	26,755	3/32,788	23,029	22,560	32,283	40,228
December	7,422	15,825	25,652	27,552	15,390	26,390	3/32,184	22,665	23,389	31,225	41,684
Arithmetic average	3,300	7,283	17,716	19,774	16,864	13,960	23,816	19,311	18,876	20,531	24,958

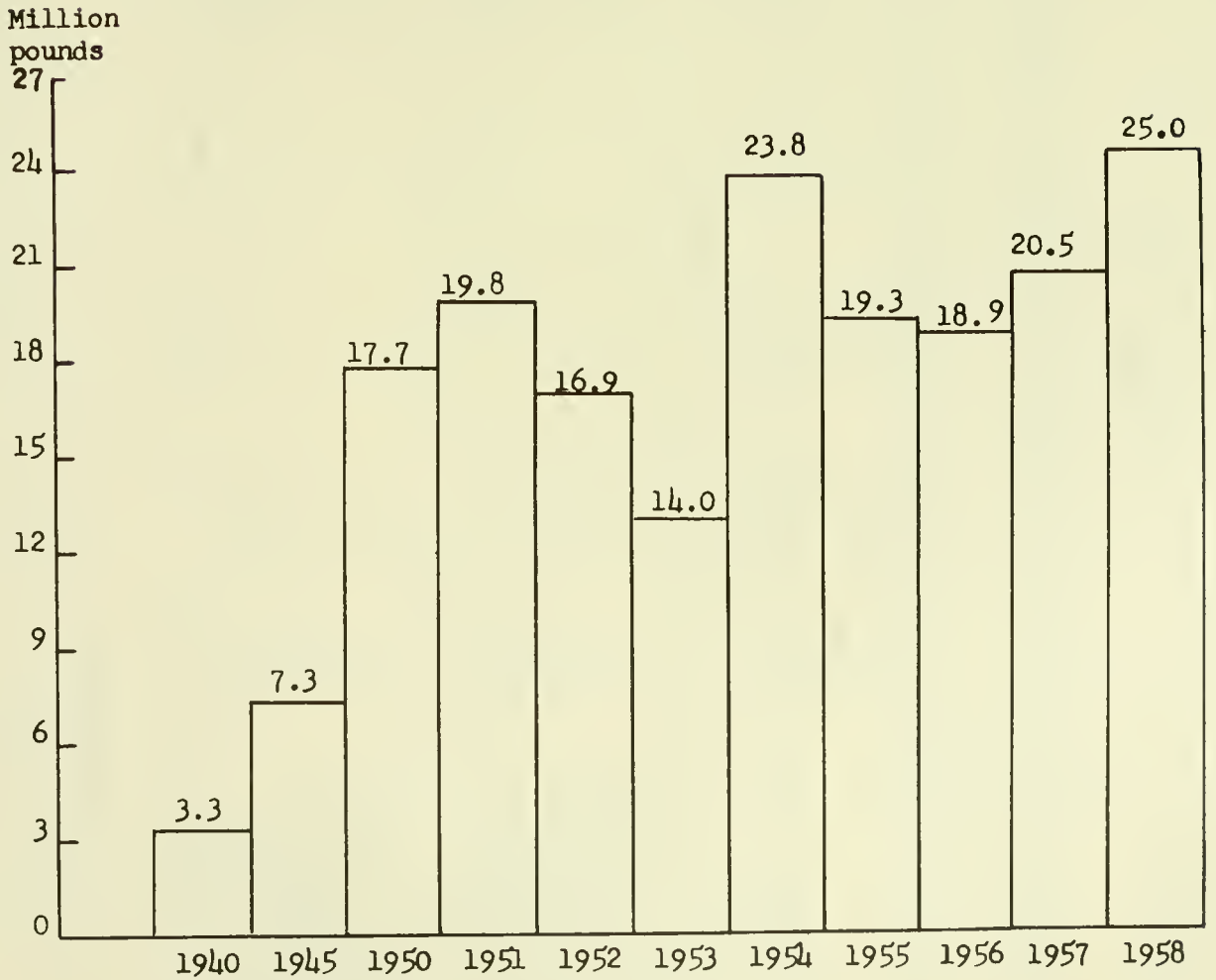
1/ Not reported separately prior to July 15, 1938 (included with other shellfish).

2/ Includes shrimp meat.

3/ Includes 2,960 thousand pounds of other than raw headless shrimp for November and 3,898 thousand pounds for December. These data were not collected separately prior to November 1954.

Note:--Data for 1955, 1956, 1957 and 1958 include raw, headless, breaded and all other shrimp.

FIGURE VII - 20.--ANNUAL AVERAGES OF END-OF-MONTH COLD STORAGE HOLDINGS OF SHRIMP, SPECIFIED YEARS



for the entire year 1954, are explainable in part in terms of a sluggish market situation which found many wholesalers overstocked. In November 1954 coverage was expanded by including data on frozen breaded holdings with data on frozen headless shrimp which were the only inventory statistics previously collected.

Cold Storage Costs

Cold storage charges for a sample of public refrigerated warehouses located at important production and consumption centers were tabulated from rate schedules supplied by the companies as follows:

TABLE VII - 16.--MONTHLY COLD STORAGE CHARGES FOR FROZEN SHRIMP PRODUCTS IN SELECTED METROPOLITAN MARKETS, 1956

	Tampa, Fla.	Phila., Pa.	Chicago, Ill.	Chicago, Ill.	New York, N.Y.	New Jersey
Company	A	B	C	D	E	F
	(Dollars per hundredweight)					
Handling						
15,000 lbs. and over	.22	.27			.33	.33
10,000-15,000 lbs.	.26	.27			.33	.33
5,000-10,000 lbs.	.30	.27			.33	.33
2,000-5,000 lbs.	.36	.29			.40	.40
Under 2,000 lbs.	.50	-			.40	.40
Shrimp (green) 1/			.42	.42		
Storage						
15,000 lbs. and over	.22	.28			.34	.27
10,000-15,000 lbs.	.26	.29			.37	.37
5,000-10,000 lbs.	.30	.29			.37	.37
2,000-5,000 lbs.	.36	.31			.45	.44
Under 2,000 lbs.	.50	-			.45	.44
Shrimp (green) 1/			.30	.30		

1/ In 50 pounds containers.

Note: The above tariffs were taken from rate schedules obtained from the respecti companies in answer to a request for currently applicable charges.

TRANSPORTATION

More than 90 percent of the shrimp marketed in fresh or frozen form is transported from primary markets to consuming centers in trucks. The popularity of truck transport is perhaps best explained by a comparison of rates charged in June 1955 by a group of trucking firms operating from the Louisiana-Texas Area to various cities outside these States with comparable railroad rates. Table VII - 17 illustrates this comparison.

In addition to rate advantages, truck transportation has other virtues, e.g., provisions for "commodity rates" with lower minimum loading weight; ability to change routes rapidly in line with changes in the market situation; more attractive drop-off privileges which allow shippers to deliver part loads at points other than the final consignee's warehouse; and the ability to accept shipments at practically any consignor's platform and to deliver them directly to the consignee's platform.

The relatively low rate for railroad freight shipments from Brownsville, Texas, to Philadelphia, Pennsylvania, and New York, New York merits special attention. The rate was established in a bid to attract the patronage of the shrimp trade. After being in effect for some time, however, this rate has failed to divert a significant proportion of the shipments over this route to the railroads. Therefore, the railroads have been considering cancellation of the rate.

Data on rates charged for transporting shrimp between various locations have been compiled by the Freight Rate Service Branch of the Agricultural Marketing Service of the United States Department of Agriculture. The rate schedules--prepared separately for different modes of transportation--are reproduced below. Table VII - 18 shows railroad freight, railway express, common motor carrier, and air freight rates.

The railway express rates shown in table VII - 18 are higher than the railroad freight and common motor carrier rates. This can be explained by the additional services performed by Railway Express Agency Inc. Schedules are faster and door to door service is included in the rate. Relatively little shrimp is shipped in this manner, primarily because of the high cost of the service.

In a similar manner, the air freight rates shown in table VII - 18 are relatively high. Air transport, therefore, is rarely used in the shipment of shrimp products.

The common motor carrier rates in table VII - 18 are for a selected group of carriers which belong to a motor carrier conference. Non-conference motor carriers are not bound by these rates. Under certain circumstances, depending on the nature of the commodity transported, even conference carriers do not have to adhere to the conference rates. This is true when shrimp are trucked by the conference carriers. The trucks then fall into the "exempt" category.

TABLE VII - 17.--TRUCK AVERAGE FOR 6 FIRMS AND RAILROAD FREIGHT RATE FOR SHIPMENTS OF FROZEN SHRIMP FROM BROWNSVILLE, TEXAS, AND NEW ORLEANS, LOUISIANA, TO SELECTED POINTS, JUNE 1955 1/

To		From Brownsville, Texas	From New Orleans, La.
		(Rate in dollars per 100 lb.)	
Cleveland, Ohio	Rail (30,000 lb. minimum)	2.622	-
	Truck (22,000 lb. minimum net)	2.115	-
Baltimore, Md. and Philadelphia, Pa.	Rail (30,000 lb. minimum)	3.0475	2.254
	Truck (22,000 lb. minimum net)	2.692	1.923
New York, New York	Rail (30,000 lb. minimum)	3.1395	2.3575
	Truck (22,000 lb. minimum net)	2.692	1.923

1/ Actual truck rate published is 30 percent higher. However, trucks will haul 130 pounds gross weight at the published charge for 100 pounds net weight. Railroads charge for every pound of gross weight and in addition charge for required refrigeration service in transit for which trucks in this instance make no charge.

TABLE VII - 18.--TRANSPORTATION RATES FOR FRESH OR FROZEN SHRIMP FROM SPECIFIED POINTS, BY SPECIFIED CARRIERS, JULY 1956 1/

From	To	Type of carrier	Minimum weight	Rate per 100 pounds	Remarks
			Carload	Dollars	
Brownsville, Texas	Chicago, Illinois	Railway Freight	24,000	2.60	Class rates
New Orleans, Louisiana	Seattle, Washington		36,000	3.45	-
Jacksonville, Florida	New York, New York		24,000	2.08	Class rates
Tampa, Florida	Philadelphia, Pennsylvania		24,000	2.17	-
Brownsville, Texas	Chicago, Illinois	Railway Express (L. C. L.)	-	7.39	Any quantity
New Orleans, Louisiana	Seattle, Washington		-	13.89	Class rates
Jacksonville, Florida	New York, New York		-	7.34	Class rates
Tampa, Florida	Philadelphia, Pennsylvania		-	7.73	Class rates
			Truckload		
Brownsville, Texas	Chicago, Illinois	Common Motor Carriers	14,000	3.63	If refrigeration available at no charge
			20,000	2.60	
New Orleans, Louisiana	Seattle, Washington		20,000	7.37	If refrigeration available at no charge
Jacksonville, Florida	New York, New York		15,000	2.90	If available at extra charge
			22,000	2.08	
Tampa, Florida	Philadelphia, Pennsylvania		15,000	3.07	If available at extra charge
			22,000	2.19	
Brownsville, Texas	Los Angeles, California	Air Freight	-	17.10	-
Brownsville, Texas	Chicago, Illinois		-	7.50	-
Jacksonville, Florida	New York, New York		-	6.85	-
Jacksonville, Florida	Philadelphia, Pennsylvania		-	6.85	-

1/ Rates shown are for comparable areas and cities.

The terminology "exempt" is based on the exemption of the trucks from certain rate filing and other miscellaneous requirements of the Inter-State Commerce Commission. The trucks do not have to file and adhere to published rates with the Commission, hence shippers can bargain with operators of trucks in this category and obtain lower rates. In addition, "exempt" carriers can give a more flexible service since they are not confined to a single route or group of routes as are the regulated motor carriers.

The statutory basis for the exemption lies in the Motor Carriers Act of 1935. When this statute was enacted, broad exemptions from certain provisions of the Act were granted to trucks transporting fresh and frozen fish and shellfish. Trucks carrying these products, provided they did not carry for compensation any passengers and property other than "exempt" property (as defined in Section 203 (b) (6) of the Motor Carriers Act of 1935), were exempted from certain regulations of the Interstate Commerce Commission which required, among other things, that permits to operate be obtained and schedules of tariffs be filed in connection with their operations.

It was left to the Courts to provide the bases for a detailed interpretation of the exemption provisions. A very important case in this connection originated with frozen shrimp shippers and truck haulers (I. C. C. vs. Love, 77 F. Supp. 63 affirmed by the United States Court of Appeals 172 F. 2nd, 224). In this case the Interstate Commerce Commission interpreted the exemptions as not including raw headless shrimp. The Courts ruled against this interpretation and, as a result, the Interstate Commerce Commission subsequently found that the term "fish" (including shellfish) as used in Section 203 (b) (6) of the Motor Carriers Act of 1935 meant "frozen, quick frozen, and unfrozen fish and shellfish in the various forms in which it is shipped, such as live fish, fish in the round, beheaded and gutted fish, filleted fish, beheaded shrimp, oysters, clams, crabs, and lobsters, with or without shells, including crab meat and lobster meat, but excluding fish and shellfish in hermetically sealed containers and fish and shellfish which have been otherwise treated for preserving such as smoked, salted, pickled, spiced, corned, or kippered".

United States Fish and Wildlife Service records indicate that in 1947 some 85 carloads of fresh or frozen shrimp were shipped by rail from Louisiana and 180 carloads from Texas. In 1951 there were only 11 carloads shipped by rail from these two States, and in 1952, only one.

The dominant position of trucks in the domestic movement of fresh and frozen shrimp is also indicated in table VII - 19 which shows receipts of fresh and frozen shrimp by type of carrier at the Chicago, Illinois, wholesale market during the years 1947-1957. Trucks, according to trade sources, are also used for the transportation of a large proportion of imported shrimp after its entry into the United States.

TABLE VII - 19.--RECEIPTS OF FRESH AND FROZEN SHRIMP AT THE CHICAGO WHOLESALE MARKET BY TYPE OF CARRIER, 1947-1957

Year	Truck	Express	Freight	Total
	(Pounds)	(Pounds)	(Pounds)	(Pounds)
1947	4,201,964	267,192	6,129,435	10,598,591
1948	3,158,550	70,148	7,507,460	10,736,158
1949	5,476,761	22,457	5,983,989	11,483,207
1950	8,775,998	-	6,567,115	15,343,113
1951	14,472,917	8,520	3,604,944	18,086,381
1952	16,281,494	25,853	3,121,414	19,428,761
1953	14,742,999	15,147	2,304,613	17,062,759
1954	16,680,200	17,400	714,800	17,412,400
1955	16,331,700	5,800	279,900	16,617,400
1956	17,332,000	8,800	592,000	17,932,800
1957	14,590,300	3,300	43,500	14,637,100

While common carriers of the "exempt" type may account for most of the truck shipments, some of the larger processors in the industry own and operate their own refrigerated trucks which are used for transporting shrimp from primary markets to consuming centers. In redistribution in consuming areas trucks, many of them privately owned, are also predominantly used.

In the movement of canned shrimp in over-the-road service the railroads are a more important factor. The rate schedules for shipments of canned shrimp to consuming centers have tended to favor rail transport.

Transportation costs constitute a smaller percentage of the retail price of canned than of frozen shrimp. Refrigeration equipment and care in handling are factors which make the transportation of frozen shrimp more costly. Greater risks are involved in moving the frozen product. Spoilage losses and loss and damage claims against the carriers have a bearing on rate schedules. Since canned shrimp usually are more valuable pound per pound than frozen shrimp, transportation costs represent a smaller share of retail price.

QUALITY PRESERVATION AND CONTROL

The technical problems of quality preservation and control are directly related to processing and marketing functions. Because of the perishable nature of shrimp, quality preservation is of utmost importance from the time the shrimp are caught to the moment they are consumed.

Causes of Quality Deterioration

The principal causes of shrimp spoilage are bacterial action and autolysis. Autolysis or self-digestion is caused by enzymatic action after death. When an animal is alive enzymes are prevented from attacking living cells but when death occurs the protective system is broken down and the enzymes start their action on the flesh.

Bacterial action appears to be much more important than autolysis in the spoilage of fishery products. The heaviest concentrations of bacteria are in the slime and the entrails of the shrimp. Spoilage micro-organisms are chiefly bacteria, yeasts, and molds. The micro-organisms found on shrimp are those commonly found in the waters and mud in which the shrimp live.

Methods of Detecting Spoilage

Deterioration of quality is detected by a study of the physical characteristics of the shrimp which are altered by decomposition. To determine spoilage two methods of examination are available. The shrimp may be examined subjectively by taste, smell, sight or touch and objectively by chemical analysis.

Odors and tastes are difficult to describe and there are no absolutes on which to base a decision. To become an expert in the detection of physical deterioration of shrimp, one must be familiar with the odor and appearance of the normal, unspoiled product. The quality inspector must have an opportunity to observe the decomposition of shrimp under conditions as nearly identical as possible to commercial practices. He must familiarize himself with the production processes for all types of processed shrimp and study the changes which take place as a result of these processes, since the odors of decomposition are often partly dissipated or changed in the processing. Only repeated tests will enable the expert to put reliance on his senses in making the distinction between the spoiled and unspoiled product.

Chemical Analysis

In recognition of the fact that there is room for honest disagreement among experts in subjective examination, there have been many investigations aimed at improving the method of chemical analysis. Acceptable chemical tests are readily reproducible in the hands of different analysts and are not affected by such factors as fatigue, time lag, emotional experience, foreign odors, etc. Many substances have been considered for measuring decomposition. A number of requirements have to be met before a compound can be used as an index of decomposition. For example: the volatile sulfur compounds in shrimp once appeared to be very useful; however, two serious objections were raised to their use. Sulfur compounds united with the can lining in a persistent and unpredictable manner and some waters used by the shrimp canners contained enough of such compounds to make the results unreliable.

It is mandatory that the substance selected as an index should not be present in sound food, or if so, only in a small and reasonably constant quantity. The ideal index would impart some, if not most, of the odor or taste which is recognized by subjective inspection and should lend itself to comparatively simple and rapid isolation, identification, and measurement procedures. To be most useful, the substance should not be affected by processing or subsequent storage. No index meeting all of these criteria has yet been found for detecting decomposition in any food.

There are substances, however, which meet enough of these requirements to prove very valuable to the food chemists. Indole 8/ has been used for several years as a means of measuring decomposition in shrimp and other shellfish. Indole results from bacterial action on tryptophan, one of the amino acids found in the protein of seafood. Absolutely fresh shrimp and oysters do not contain measurable amounts of indole, although the test is capable of detecting as little as five

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8/ For chemical method see Journal of the Association of Official Agricultural Chemists, May 1946, "Indole in Shrimp", R. F. Dugan and L. W. Strasburger.

millionths of a gram. Unfortunately for the food chemist, only certain bacteria produce indole from tryptophan; therefore, shrimp may be decomposed and have little or no detectable indole present. So far the indole method has been used only to support the testimony of an expert who has made a subjective identification of spoilage.

Taste Panel Testing

As an example of taste panel testing, a recent laboratory experiment based on 5 different lots of shrimp revealed information with respect to periods of maximum safe storage of iced shrimp.

Fresh caught shrimp retained their fresh sweet flavor during the first 5 days of ice storage. From the sixth to the eighth day of storage the shrimp rapidly lost their sweet flavor and became tasteless ("stale shrimp"). From the eighth to the twelfth day of storage the shrimp were tasteless but no off-odors or flavors were evident. After 12 days of ice storage, spoilage took place and the cooked meats had off-odors and flavors. The results obtained from the use of the chemical tests were in substantial agreement with those obtained from taste panel testing.

Frozen shrimp which are stored at 0° F. (-18° C.) lose their quality very slowly. Both the quality of frozen shrimp and the length of time they remain an acceptable product during frozen storage is affected by the length of time that the shrimp are stored in ice prior to freezing. Taste panel testing is more effective in discovering quality differences resulting from differences in length of time of iced storage prior to freezing than chemical testing. Chemical tests showed only minor changes in quality over a 12-month period for samples of frozen shrimp stored in ice, 1, 6, and 12 days prior to freezing. A taste panel group, however, was able to detect marked differences between these samples after relatively short periods of storage. The longer shrimp were stored in ice before freezing, the poorer the quality of the frozen product.

Ultraviolet Light

A method of quality determination which differs from the ones described above involves the study of changes in the fluorescence induced by ultraviolet ("black") light in iced shrimp. According to experiments, any shrimp which shows brilliant white fluorescence of the tissues at the headed end or elsewhere when peeled and exposed to ultraviolet light of about 2,570 angstoms, can be graded as spoiled or rapidly spoiling. A faint white fluorescence in the headed region indicates the first onset of spoilage. In the experiments,the white fluorescence generally occurred after 6 to 10 days when the shrimp had been held in "Rickey" type ice. It was thought that buyers could use the method for testing shrimp samples at the dock or from shipments of iced shrimp delivered to processing plants.

Quality Control

Quality control must start immediately after the net is hauled aboard the boat. Exposure to heat, trawling too long, allowing oil slick to settle on the deck, failure to wash or ice the shrimp properly, and negligent handling in unloading and transferring are among the many causes of spoilage over which vessel personnel have some degree of control. Other known factors are delays caused by stormy weather, prolonged heat spells, exhaustion of the vessel's ice supply or a mechanical breakdown in refrigeration equipment. Quality control during production and processing are described in the following sections.

Aboard Ship

Proper methods of icing shrimp and insulating storage bins aboard ship have been described in Chapter III - Fishing Operations. When shrimp are held too long in ice, softening, "black-spot" discoloration, and loss of flavor will occur. Melanogenesis or "black-spot" formation in the shell of the shrimp does not necessarily indicate spoilage of product. It is caused by oxidization rather than by bacteria. As experiments described below have shown, it can be combated by dipping the shrimp in sodium bisulfite solutions. Sodium bisulfite is a cheap chemical which has been used for years in the processing of dried fruits to prevent darkening. The encouraging results obtained by the research staff of the Marine Laboratory of the University of Miami, Florida, in their tests with shrimp samples have brought about the approval by the United States Food and Drug Administration of this chemical for use in controlling "black-spot" formation. The user of the anti-oxidant must be cautioned that overexposure of shrimp to sodium bisulfite may cause yellowish discoloration as well as a slight off-taste.

Though not indicative of spoilage, "black-spot" will account for a down-grading of quality and lowered receipts for the catch. Thus, shrimp which normally would be graded as "pearls" 9/ (top quality) could be sold only as "good" 9/, the next lower classification. Where quality deterioration has proceeded to the point where the color on the belly of the shrimp appears gray (as the result of the progressive leaching by the melting ice water), the catch would be rated as "culls" 9/, the lowest standard for unbroken shrimp.

Signs of quality deterioration other than "black-spot" are increased bacterial loads and olefactory sensations imparted by the so-called "iodoform", "sulfide", and "stinker" shrimp. Interesting to note in this connection are the alleged increased deterioration rates of shrimp caught at night as compared to those of shrimp caught during day-time, a phenomenon which some fishermen ascribe to moonlight.

9/ Grade classifications used in Florida ports.

For fishermen with larger boats and the required capital for a freezer installation the solution of the quality problem has been the freezing and packaging of raw headless shrimp aboard vessel. Other methods successfully applied for the purpose of preserving quality are the holding of fresh shrimp aboard vessel in refrigerated sea water or the provisional freezing of shrimp at sea in low-temperature brine followed by thawing, packaging, and refreezing ashore.

Technologists of the United States Bureau of Commercial Fisheries are inclined to favor the freezing of shrimp in brine as a method of quality preservation. The primary advantage of this method is to reduce the spoilage which results from allowing shrimp to remain out of water too long before processing. Other advantages lie in the reduction of storage space required aboard vessels since ice does not have to be carried; shrimp frozen in this manner are individually glazed so that any amount may be removed and thawed without damage to the remainder. The method so far has failed to gain full acceptance by the industry because of certain attendant disadvantages. Primary among the latter is the high cost of the installation required (see Chapter II - Agents of Production). Also, crews must be trained in the operation and maintenance of the refrigeration equipment.

Experiments have indicated that shrimp held in sea water chilled to 29-32° F. are superior in flavor and appearance to shrimp held in crushed ice. "Black-spotting" is eliminated. A weakness of the method is the development of undesirable odors in the shrimp.

Results of additional tests conducted by the University of Miami, Florida (see above), further proved that: (a) concentrations of 5 to 10 p. p. m. aureomycin hydrochloride eliminated the undesirable odors of shrimp, (b) no measurable differences in quality could be detected among shrimp held in three sizes of ice particles, (c) shrimp dipped twice for 1 minute periods in 2-1/2 percent concentrations of sodium bisulfite showed marked reduction in the amount of melanosis or "black-spot" after being held on ice.

In Canning Establishments

In the processing segment of the industry quality control is most advanced in canning establishments. The canners adhere to an established set of standards. In most instances, these standards are based on those developed either by the National Canners Association or by the United States Food and Drug Administration. The plants frequently hire the service of consulting food technologists who together with regular plant personnel participate in the inspection of the product.

Under Section 701 of the Federal Food, Drug, and Cosmetic Act, the Food and Drug Administration of the United States Department of Health, Education, and Welfare is granted authority to give inspection service to shrimp processing plants. 10/ This authority has been used by some canneries to control quality in processing. Resident inspectors are assigned to the cannery, and it is their duty to see that the regulations of the Act are complied with. The service is granted for a minimum of 9 months. The firms subscribing pay fees to defray the cost of the service which, in 1955, was $500 a month plus 15 cents per case in plants visited by the Bureau of Business and Economic Research of the University of Miami, Florida. Firms utilizing the government inspection service are entitled to place on their labels the statement: "Production supervised by United States Food and Drug Administration."

The federal inspection service is not mandatory. During the 1930's federal inspection was quite popular and more than 30 canneries were utilizing it. The cost of the service has steadily increased since that time and as a result, only seven canners were using government inspectors in the summer of 1955.

In Freezing Establishments

Quality control in plants producing frozen headless shrimp is left to the discretion of the individual processor. Other than the voluntary standards of the Shrimp Association of the Americas there are no set or specifically spelled out standards to adhere to. Trade practice requires that shrimp size or count per pound be indicated either on the inside package or on the master carton. Quality control in the freezing establishments visited by the research firms working under contract to the United States Fish and Wildlife Service was limited to visual inspection of shrimp prior to grading to cull out damaged shrimp or other extraneous matter, a frequent spot-checking of cartons to verify correctness of grade and weight of pack, and a penetration testing of product before glazing to check temperature. There apparently is no standard for the amount of water needed or the method to be used in assuring proper glazing of the frozen product.

Belief has existed that the more rapid the freezing, the better the product, because the small crystals formed by fast freezing would not penetrate the cell walls. It was reasoned that the large ice crystals which formed during relatively slow freezing punctured the cell walls and freed the fluids which caused "drip" on thawing. Research has shown that the temperature of storage is far more important than the rate of freezing, unless freezing is so slow that decomposition occurs during this operation.

10/ The inspection provisions relating to canned shrimp are reproduced in Appendix A of this chapter.

Evidence now shows that freezer deterioration is partially dependent on the mean storage temperature--and that the main disadvantage of a fluctuating increase in temperature is to increase the mean temperature. High storage temperatures (above 10° F.) should always be avoided because of the relatively rapid rate of deterioration.

Spoilage has occurred as the result of overloading of the freezer with warm packaged fish or shellfish; the packaging material, acts as insulation against the cold air. The practice of using freezers as a means of "saving" the "not too fresh" product can also be blamed for the failure of some frozen products to meet quality standards.

Plants producing breaded shrimp products may use voluntary standards for frozen raw breaded shrimp which have been promulgated by the Department of the Interior. An inspection service is available from the Department for any firm desiring to effect the standards.

During Transportation

The United States Department of Agriculture suggests the following cautions to be observed during transportation:

1. Shippers should inspect transportation equipment in which their merchandise is to be transported. This applies to carloads and truckloads alike.

2. Truck equipment should be supplied with floor racks and lathes should be placed so as to allow air circulation throughout the load.

3. Mechanical refrigeration equipment should be checked to see if it is adequate to assure proper refrigeration of the entire load. If necessary, dry ice should be added.

4. Equipment should be pre-cooled. If water ice is used, drains should be checked for stoppage; plugs should fit securely in the ice bunkers.

5. Refrigerator cars should be pre-cooled for at least 24 hours during warm to hot weather.

6. Ice and salt should not be spared during warm to hot weather.

7. A check should be made of the location of icing stations en route to destination to see if they are properly spaced to insure re-icing every 12 to 16 hours during hot weather.

8. Circuitous routings should be avoided.

9. Trucks are susceptible to a tremendous amount of heat over the highways during hot weather. An attempt should be made to avoid unreasonable layovers on long-haul shipments.

10. Since the shipper is generally held responsible for the condition of the merchandise on arrival at destination, care in shipping will save claims and a disappointed customer.

MARKET COMMUNICATIONS

The primary and basic characteristic of shrimp marketing is flexibility. To cope with the vagaries of the market for a highly perishable product, sellers must be able to shift quickly from one outlet to another. Therefore the maintenance of a regular flow of communications between market and producer is of great importance.

The use of the telephone has become virtually indispensable for the marketing process; nearly all buying and selling of shrimp is done by this means.

Characteristic of the marketing structure of the industry is the total lack of written contractual agreements. Sales are negotiated and closed by telephone, and the good faith of buyer and seller is relied upon for performance. Because of the emphasis placed on good faith, it is to the credit of those engaged in the buying and selling of shrimp that this system has succeeded so well. Misunderstandings and complaints do occur on occasions. Such complaints are heard more often in the fresh market where more latitude may be used in describing the product over the telephone than is used in the frozen or canned shrimp market.

Appendix B of this chapter contains a brief summary of sources of information on the shrimp industry currently published by the Bureau of Commercial Fisheries.

Published in Federal Register April 16, 1953; 18 F.R. 2128

TITLE 21--FOOD AND DRUGS

Chapter I--Food and Drug Administration
Department of Health, Education, and Welfare

PART 85 —SEA FOOD INSPECTION

INSPECTION OF PROCESSED SHRIMP AND CANNED OYSTERS [1]

* * * * *

SUBPART A—INSPECTION OF PROCESSED SHRIMP

Sec.

AUTHORITY: §§ 85.1 to 85.14 issued under sec. 701, 52 Stat. 1055; 21 U. S. C. 371.

SUBPART A—INSPECTION OF PROCESSED SHRIMP

§ 85.1 *Application for inspection service.* (a) Applications for inspection service on the processing of shrimp under the provisions of section 702a of the Federal Food, Drug, and Cosmetic Act shall be on forms supplied by the Food and Drug Administration, hereinafter referred to as the Administration. The processing of shrimp comprises all the operations, including labeling and storage, necessary to prepare for the market shrimp in any of the following forms: Iced or frozen raw headless, raw peeled or cooked peeled (any of which may be deveined); iced or frozen deveined shrimp, partially or completely peeled (which may be battered and breaded before freezing), and canned shrimp. No application for a regular inspection period filed with the Administration after May 1, preceding such period in any year, shall be considered unless the applicant shows substantial cause for failure to file such application on or before May 1 of such year. A separate application shall be made for each inspection period in each establishment for which the service is applied. Each application for a regular inspection period shall be accompanied by an advance payment of $500.00 as prescribed by § 85.13 (a) (1). Such payment shall be made in the manner prescribed by § 85.13 (e).

(b) For the purposes of §§ 85.1 through 85.14, an establishment is defined as a factory where shrimp may be processed and warehouses and cold storage plants under the control and direction of the packer where such shrimp is stored.

§ 85.2 *Granting or refusing inspection service; cancellation of application.* (a) The Secretary of Health, Education, and Welfare may grant the inspection service applied for upon determining that the establishment covered by such application complies with the requirements of § 85.6.

(b) The Secretary may refuse to grant inspection service at any establishment for cause. In case of refusal, the applicant shall be notified of the reason therefor and shall have returned all advance payments and deposits made,

[1] This order rescinds former §§ 155.0 to 155.13, dealing with canned shrimp; §§ 155.16 to 155.29, dealing with fresh and frozen shrimp; and §§ 155.30 to 155.43, dealing with canned oysters.

On April 11, 1953, the Federal Security Agency became the Department of Health, Education, and Welfare. This document was signed on April 10 and published in the Federal Register of April 16 over the signature of the Administrator. Appropriate changes have been made in the context to cover the changes contemplated by Reorganization Plan No. 1, 1953.

less any expenses incurred for preliminary inspection of the establishment or for other purposes incident to such application.

(c) The applicant, by written notice to the Secretary , may withdraw his application for inspection service before July 1 preceding the inspection period covered by the application. In case of such withdrawal, the Secretary shall return to such applicant all advance payments and deposits made, less any salary and other expense incurred incident to such application.

§ 85 .3 *Inspection periods.* (a) The regular inspection period in each establishment in which inspection service under §§ 85 .1 through 85 .14 is granted consists of 9 consecutive months. The date of the beginning of such regular inspection period shall be regarded as the date, on or after July 1 but not later than October 1, specified for the beginning of the service in the application therefor, or such other date as may be specified by amendment to such application and approved; but if the Secretary is not prepared to begin the service on the specified date, then the period shall start on the date on which service is begun.

(b) Extension inspection periods shall begin at the close of the preceding inspection period. Extension inspection periods may be granted for periods of 1 month and/or fractional parts of 1 month, but in no case less than 1 day Extension inspection periods for 1 month may be granted in such establishment if application therefor, accompanied by a payment of $600.00 as prescribed by § 85 .13 (a) (3), is made at least 2 weeks in advance of the close of such preceding inspection period. Applications for extension inspection periods for fractional parts of a month may be accepted when accompanied by the payment prescribed by § 85 .13 (a) (3) for such extensions. No regular or extension inspection period shall extend beyond June 30 of any year.

(c) Upon request of the packer, and with the approval of the Administration, such service during any inspection period may be transferred from one establishment to another to be operated by the same packer; but such transfer shall not serve to lengthen any inspection period or to take the place of an extension inspection period. In case of such transfer the packer shall furnish all necessary transportation of inspectors.

(d) The inspection service shall be continuous throughout the inspection period.

§ 85.4 *Assignment of inspectors.* (a) An initial assignment of at least one inspector shall be made to each establishment in which inspection service under §§ 85 .1 through 85 .14 is granted. Thereafter, the Administration shall adjust the number of inspectors assigned to each establishment and tour of duty of each inspector to the requirements for continuous and efficient inspection.

(b) Any inspector of the Administration shall have free access at all times to all parts of the establishment, to plants supplying materials to the inspected establishment, and to all fishing and freight boats and other conveyances catching shrimp for, or transporting shrimp to, such establishment.

§ 85 .5 *Uninspected shrimp excluded from inspected establishments.* (a) No establishment to which inspection service has been granted shall at any time thereafter process shrimp which has not been so inspected or handle or store in such establishment any processed shrimp which has not been so inspected; but this paragraph shall not apply to an establishment after termination of inspection service therein or withdrawal therefrom as authorized by § 85 .14.

(b) All shrimp and other ingredients entering into the finished product may be subject to inspection prior to delivery to the establishment or at any time thereafter, and all shrimp processed in such establishment shall be subject to certification under § 85 .12.

§ 85 .6 *General requirements for plant and equipment.* (a) All exterior openings of the establishment shall be adequately screened, and roofs and exterior walls shall be tight. When necessary, fly traps, fans, blowers, or other approved insect-control devices shall be installed.

(b) Except for raw headless shrimp, which may or may not be deveined, picking and packing rooms shall be separate, provided that this requirement may be waived by the Administration where separation of picking and packing rooms is not necessary for adequate sanitation. Blanching tanks shall not be located in picking room. Fixtures and equipment shall be so constructed and arranged as to permit thorough cleaning. Such rooms shall be adequately lighted and ventilated, and the floors shall be tight and arranged for thorough cleaning and proper drainage. Open drains from picking room shall not enter packing or blanching room. If picking and packing rooms are in separate buildings, such buildings shall be not more than 100 yards apart unless adequate provisions are made to enable efficient inspection.

(c) All surfaces of tanks, belts, tables, flumes, utensils, and other equipment with which either picked or unpicked shrimp come in contact after delivery to the establishment shall be of metal or of other smooth nonporous and easily cleanable materials, provided such materials are not lead or other toxic substances. Metal seams shall be smoothly soldered or smoothly welded.

(d) Adequate supplies of suitable detergents and sanitizing agents approved by the Administration; clean, unpolluted runing water; and, if necessary, steam shall be provided for washing, cleaning, and otherwise maintaining the establishment in a sanitary oondition.

(e) Adequate toilet facilities of sanitary type which comply fully with applicable State laws and local ordinances shall be provided.

(f) An adequate number of sanitary washbasins, with liquid or powdered soap, shall be provided in both the picking and packing rooms. Paper towels shall be provided in the packing room. Provision shall be made for sanitizing the hands of employees by the use of suitable sanitizing agents.

(g) Signs requiring employees handling shrimp to wash and sanitize their hands after each absence from post of duty shall be conspicuously posted in the picking and packing rooms and elsewhere about the premises as conditions require.

(h) One or more suitable washing devices and one or more suitable inspection belts shall be installed for the washing and subsequent inspection of the shrimp before processing.

(i) Suitable containers, flumes, chutes, or conveyors shall be provided for removing offal from picking room.

(j) Picking or heading tables shall be equipped with flumes supplied with clean, unpolluted water or with mechanical conveyors for removing the picked or headed shrimp.

(k) Equipment shall be provided for code-marking cans and other immediate containers and master cartons used in packaging other than canned shrimp.

(l) An automatic container-counting device shall be installed in each cannery line.

(m) Each sterilizing retort shall be fitted with at least the following equipment:

(1) An automatic control for regulating temperatures.

(2) An indicating mercury thermometer of a range from 170° F. to 270° F. with scale divisions not greater than 2° F. For steam cook such thermometers shall be installed either within a fitting attached to the shell of the retort or within the door or shell of the retort. For water cook such thermometers shall be installed in the door or shell of the retort below the water level. If the thermometer is installed within a fitting such fitting shall communicate with the chamber of the retort through an opening at least 1 inch in diameter. Such fitting shall be equipped with a bleeder at least ⅛-inch in diameter. If the thermometer is installed within the door or shell of the retort, the bulb shall project at least two-thirds of its length into the principal chamber.

(3) A recording thermometer of a range from 170° F. to 270° F. with scale divisions not greater than 2° F. The bulb of such thermometer shall be installed as prescribed for the indicating mercury thermometer. The case which houses the charts and recording mechanism shall be provided with an approved lock, all keys to which shall be in the sole custody of the inspector.

(4) A pressure gauge of a range from 0 to 30 pounds, with scale divisions not greater than 1 pound and diameter of not less than 5 inches. Such gauge shall be connected to the chamber of the retort by a short gooseneck tube. The gauge shall be not more than 4 inches higher than the gooseneck.

(5) For steam cook, a blow-off vent of at least ¾-inch inside diameter in the top of the retort.

(6) For steam cook, a ⅛-inch bleeder in top of retort.

(n) Each cold storage compartment shall be fitted with at least the following equipment:

(1) An automatic control for regulating temperature.

(2) An indicating thermometer so installed as to indicate accurately the temperature within the storage compartment.

(3) A recording thermometer so installed as to indicate accurately the temperature within the compartment at all times. The case which houses the charts and recording mechanism shall be provided with an approved lock, all keys to which shall be in the sole custody of the inspector.

(o) Provision shall be made for water-glazing where such glazing is necessary to maintain the quality of frozen shrimp. Glazing shall be done with clean, unpolluted water.

(p) Provision shall be made for immediate icing or cold storage of all packaged shrimp which is destined for sale as unfrozen shrimp.

(q) Suitable space and facilities shall be provided for the inspector to prepare records and examine samples, and for the safekeeping of records and equipment.

§ 85 .7 *General operating conditions.* (a) Plants supplying raw headless or frozen raw headless shrimp to an inspected establishment, decks and holds of all boats catching shrimp for or transporting shrimp to an inspected establishment, and the bodies of other conveyances so transporting shrimp shall be kept in a sanitary condition.

(b) Inspected establishments, plants supplying inspected establishments, freight boats, and other conveyances serving such establishments shall accept only fresh, clean, sound shrimp. The shrimp shall be iced or refrigerated immediately after they are caught, and shall be kept adequately iced or refrigerated until delivery to the establishment.

(c) After delivery of each load of shrimp to the establishment, decks and holds of each boat and the body of each other conveyance or container making such delivery shall be washed down with clean, unpolluted water, and all debris shall be cleaned therefrom before such boat or other conveyance or container leaves the establishment premises.

(d) Before being headed, picked, or deveined, the shrimp shall be adequately washed with clean, unpolluted water and then passed over the inspection belt and culled to remove all shrimp that are filthy, decomposed, putrid, or otherwise unfit for food, and all extraneous material.

(e) Offal from picking tables shall not be piled on the floor, but shall be placed in suitable containers for frequent removal, or shall be removed by flumes, conveyors, or chutes. Offal, debris, or refuse from any source whatever shall not be allowed to accumulate in or about the establishment.

(f) Shrimp shall be picked into flumes that immediately remove the picked meats from the picking tables; except that shrimp may be picked into seamless containers of not more than 3 pints capacity if the picked meats are not held in such containers for more than 20 minutes before being flumed or conveyed from the picking tables. If shrimp are picked into such containers, the containers shall be cleaned and sanitized as often as may be necessary to maintain them in a sanitiary condition, but in no case less frequently than every 2 hours. Whenever a picker is absent from his or her post of duty, the container used by such picker shall be cleaned and sanitized before picking is resumed. For the purposes of this paragraph, the term "picked" shall include the operation whereby a portion of the shell is removed, leaving the tail in place, and the back of the shrimp is sliced open to remove the alimentary canal or vein.

(g) Picked shrimp being transported from one building to another shall be properly covered and protected against contamination.

(h) From the time of delivery to the establishment up to the time of final processing, shrimp shall be handled expeditiously and under such conditions as to prevent contamination or spoilage. Shrimp other than that to be canned shall be precooled immediately after the final cleaning or blanching operation to a temperature not exceeding 50° F. if it is to be packaged immediately, or to a temperature not exceeding 40° F. if it is not to be packaged immediately. If such shrimp are to be frozen, they shall be placed in the freezing compartment within 1 hour after final preparation.

(i) If batter is employed, it shall be used within 1 hour after it is prepared. The temperature of the batter shall not exceed 50° F.

(j) The packer shall destroy for food purposes under the immediate supervision of the inspector all shrimp in his possession condemned by the inspector as filthy, decomposed, putrid, or otherwise unfit for food. Shrimp condemned on boat or unloading platform shall not be taken into the icebox or picking room.

(k) Raw materials other than shrimp that enter into the finished product shall not be used if condemned by the inspector as unfit for food. Such condemned raw materials shall be segregated from usable materials and be held for disposal as directed by the inspector, or they may be destroyed forthwith by the packer if he so desires.

(l) All portions of the establishment shall be adequately lighted to enable the inspector to perform his duties properly.

(m) All floors and other parts of the establishment, including unloading platforms, and all fixtures, equipment, and utensils shall be cleaned as often as may be necessary to maintain them in a sanitary condition. Containers for mixing or holding batter shall be adequately cleaned and sanitized before they are used for a new batch of batter. Equipment for applying batter shall be adequately cleaned and sanitized at least once each hour while in operation.

(n) The packer shall require all employees handling shrimp to wash and sanitize their hands after each absence from post of duty, and to observe other proper habits of cleanliness.

(o) The packer shall not knowingly employ in or about the establishment any person afflicted with an infectious or contagious disease, or with any open sores on exposed portions of the body.

§ 85 .8 *Code marking.* (a) Permanently legible code marks shall be placed on all immediate containers at the time of packaging. Such marks shall show at least:

(1) The date of packing;

(2) The establishment where packed; and

(3) The size of the shrimp when such shrimp are graded for size and are not in containers through which they are clearly visible.

Corresponding code marks shall also be placed on the master cartons containing individual packages of shrimp other than canned.

(b) Keys to all code marks shall be given to the inspector.

(c) Each lot shall be stored separately pending final inspection, with a space of not less than 6 inches between stacks of each lot. For the purposes of the regulations in this part, all cans or other containers bearing the same code marks shall be regarded as comprising a lot.

§ 85 .9 *Processing.* (a) The closure of the can or other immediate container and the time and temperature of sterilizing the canned shrimp shall be adequate to prevent bacterial spoilage.

(b) The following times and temperatures shall be the minimums employed for the containers indicated:

DRY PACK

Kind of container and liner	Size	Initial temperature	Time at 240° F.	Time at 250° F.
			Minutes	*Minutes*
Tin:				
1-piece liner	211 x 400 and smaller.	70° F.	80	60
No liner	do	70° F.	70	50
	307 x 208	70° F.	70	50
	307 x 400	70° F.	75	55

WET PACK

Kind of container and size	Initial temperature	Time at 240° F.	Time at 250° F.
		Minutes	*Minutes*
Tin:			
211 x 400 (and smaller)	90° F.	25	13
307 x 208	90° F.	25	13
307 x 400	90° F.	25	13
502 x 510	90° F.	27	16
Glass: 2 to 9 fluid ounces, inclusive		22	14

For wet-pack shrimp in cans 307 x 400 and smaller, a cook of 12 minutes at 250° F., and for wet-pack shrimp in cans 502 x 510, a cook of 15 minutes at 250° F. may be approved if adequate provisions are made to insure an initial temperature of not less than 120° F. in each individual can. For the purposes of this section, initial temperature is defined as the average temperature of the contents of the container at the moment steam is admitted to the sterilizing retort.

(c) For steam cook, blow-off vent shall be open during the coming-up period until the mercury thermometer registers at least 215° F. Bleeders shall emit steam during the entire cooking period.

(d) The method of freezing is not specified by the regulations in this part. Whatever method is used must be such as will produce a hard-frozen product in a sufficiently short time to prevent decomposition. Bulk packages containing 5 pounds or more of shrimp per package shall be hard frozen within 24 hours; smaller packages should be hard frozen within 12 hours. After freezing, the shrimp shall be stored in such a manner that its temperature does not exceed 0° F., and shall be handled in such manner as will maintain the hard-frozen condition.

(e) The storage temperatures for shrimp that are not frozen or canned are as follows:

(1) Cooked and peeled shrimp shall be stored at a room temperature not exceeding 35° F.

(2) Raw headless shrimp shall be stored at a room temperature not exceeding 35° F., except that it may be stored at a higher room temperature if sufficiently iced at all times to prevent spoilage.

(f) The inspector shall identify each record on the thermometer chart with the code mark of the lot to which such record relates and the date of such record. The Administration shall keep such charts for at least 5 years, and upon request shall make them available to the packer.

(g) The packer shall keep for at least 1 year all shipping records covering shipments from each lot, and upon request shall furnish such records to any inspector of the Administration.

§ 85 .10 *Examination after processing.* (a) Adequate samples shall be drawn by the inspector from each lot of processed shrimp and shall be examined to determine whether or not such processed shrimp conforms to all requirements of the Federal Food, Drug, and Cosmetic Act, amendments thereto, and regulations thereunder.

(b) The packer shall destroy for food purposes, under the immediate supervision of the inspector, all processed shrimp condemned by the inspector as not complying with § 85 .9 (a), or as filthy, decomposed, putrid, or otherwise unfit for food.

§ 85 .11 *Labeling.* (a) Labels on shrimp packed and certified under §§ 85 .1 through 85 .14 may bear a mark attesting to such packing and certification. Depending upon the type of processing, such marks, if used, shall read as follows:

(1) For canned shrimp: "Production supervised by U. S. Food and Drug Administration."

(2) For frozen shrimp: "Packing and freezing supervised by U. S. Food and Drug Administration. Perishable product—Not warranted against mishandling after freezing."

(3) For fresh, iced, or refrigerated shrimp: "Packing supervised by U. S. Food and Drug Administration. Perishable product—Not warranted against mishandling after packing."

Such marks if used shall be plainly and conspicuously displayed in type of uniform size and style on a strongly contrasting uniform background. The marks referred to in subparagraphs (2) and (3) of this paragraph shall not be used on the master carton unless such marks will be defaced by the opening of the cartons.

(b) Labels on inspected processed shrimp, other than canned shrimp, not bearing the marks referred to in paragraph (a) (2) and (3) of this section, and all master cartons for inspected shrimp other than canned shrimp, shall bear the statement "Perishable—Keep frozen" or "Perishable—Keep refrigerated," whichever is applicable to the product.

(c) Two proofs, or one proof and one photostat thereof, or eight specimens of all labeling intended for use on inspected shrimp, or on or within the cases therefor, shall be submitted to the Administration for approval. If proofs or photostat and proof are submitted, eight specimens of the labeling shall be sent to the Administration after printing.

The Administration is authorized to approve labeling for use on or with processed shrimp inspected under §§ 85 .1 through 85 .14; approval shall be subject to the condition that such labeling shall be so used as to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, amendments thereto, and regulations thereunder. The Administration is also authorized to revoke any such approval for cause. The Administration shall not approve labeling for processed shrimp intended for export under the provisions of § 85 .12 (e).

(d) No commercial brand or brand name appearing on labeling approved as authorized under paragraph (c) of this section and bearing the marks described in paragraph (a) of this section, and no labeling simulating any such approved labeling, shall be used, after such approval, on processed shrimp other than that which has been handled, prepared, packed, and stored in compliance with all provisions of §§ 85 .1 through 85 .14; but this section shall not apply to any packer's labeling not bearing such mark after termination of inspection or withdrawal thereof as authorized by § 85 .14 or to any distributor's labeling not bearing such mark after written notice by the owner thereof to the Administration that the use of such labeling on inspected processed shrimp has been discontinued and will not be resumed.

(e) Shrimp labeling authorized by paragraph (a) of this section or approved under paragraph (c) of this section shall be used only as authorized by §§ 85 .1 through 85 .14. Unauthorized use of such labeling renders the user liable to the penalties prescribed by the Federal Food, Drug, and Cosmetic Act, as amended.

§ 85 .12 *Certificates of inspection; warehousing and export permits.* (a) After finding that the processed shrimp comprising any parcel has been handled, prepared, and packed in compliance with all provisions of §§ 85 .1 through 85 .14, bears labeling approved as authorized under § 85 .11 (c), and complies with all the provisions of the Federal Food, Drug, and Cosmetic Act, amendments thereto, and regulations thereunder, the inspector shall issue a certificate showing that such processed shrimp so complies. The certificate shall specify the code marks to which it applies, the quantity of the parcel so marked, the place where such parcel is stored, the size of the shrimp, the size and kind of containers, the type of pack, the commercial brand name on the labels, the quality grade of the shrimp if it is fancy, the condition of the shrimp if it is broken or if it is substandard in fill and the destination of the lot if known. Such certificate shall become void if such labeling is removed, altered, obliterated, or replaced, or if mishandling, improper storage, or other circumstances so change the product that it no longer complies with the requirements for the issuance of a certificate; but such processed shrimp may be relabeled under the supervision of an inspector and recertified if the inspector finds that, after being relabeled, it complies with the requirements laid down by this paragraph for the issuance of a certificate.

(b) Unless covered by certificate, processed shrimp shall be moved from an inspected establishment only for storage authorized under paragraph (c) of this section, or for export authorized under paragraph (e) of this section, or for destruction as provided by § 85 .10 (b).

(c) Applications to move unlabeled processed shrimp for storage in a warehouse or cold storage plant elsewhere than in the establishment where such shrimp was processed shall be on forms supplied by the Administration. The application shall give the name and location of the warehouse or cold storage plant in which such processed shrimp is to be stored, and shall be accompanied by an agreement signed by the operator of such warehouse or cold storage plant that inspectors shall have free access at all times to all processed shrimp so stored and that conditions which will preserve the identity of each parcel of such processed shrimp shall be continuously maintained pending issuance of a certificate thereon or removal as authorized by paragraph (d) of this section. If such application is approved and it appears to the inspector that the processed shrimp comprising any parcel has been packed in compliance with §§ 85 .1 through 85 .14 and conforms, except for the absence of labeling, to all requirements of the Federal Food, Drug, and Cosmetic Act, amendments thereto, and regulations thereunder, the inspector shall issue to the applicant, on his request, a warehousing permit covering such processed shrimp. Such permit shall specify the code marks to which it applies, the quantity of the parcel so marked, the places from and to which such parcel is to be moved, the size of the shrimp, the size and kind of containers, the type of pack, whether or not it is fancy grade, the condition of the shrimp if it is broken or if it is substandard in fill, and, if such be the case, that it is intended for export under paragraph (e) of this section. When any provision of the agreement is violated, the Administration may revoke any permit issued pursuant to such agrement, and may also revoke its approval of the application for warehousing or cold storage which accompanied such agreement.

(d) Unless covered by certificate, processed shrimp stored under the authority of paragraph (c) of this section shall be moved from the warehouse or cold storage plant where stored only for restorage under such authority, or for return upon written permission of the inspector to the establishment where processed, or for export authorized under paragraph (e) of this section, or for destruction as provided by § 85 .10 (b).

(e) An application to export processed shrimp under the provisions of section 801 (d) of the act shall be accompanied by the original or a verified copy of the specifications of the foreign purchaser; if required by the Administration, evidence showing that such processed shrimp is not in conflict with the laws of the country to which it is intended for export; and, if shipment of labeled processed shrimp is specified or directed, eight specimens of the labeling therefor. If processed shrimp prepared or packed according to such specifications is not in conflict with the laws of such country, the Administration shall direct the inspector to issue to the applicant an export permit covering such processed shrimp comprising any parcel ordered by such purchaser under such specifications, when the inspector finds that such processed shrimp was packed in compliance with the requirements of §§ 85 .1 through 85 .14 regarding sanitary conditions and processing; is not filthy, decomposed, putrid, or otherwise unfit for food; accords to such specifications; and is labeled on the outside of the shipping package to show that it is intended for export. Such permit shall specify the code marks to which it applies and the quantity of the parcel so marked, and shall show that such processed shrimp was packed under sanitary conditions, is wholesome, and accords to such specifications. The applicant shall furnish to the inspector documentary evidence showing the exportation of all such processed shrimp.

§ 85 .13 *Inspection fees.* (a) (1) Except as otherwise provided by the regulations in this part, an initial payment of $500.00 shall accompany each application; thereafter, eight additional advance payments of $500.00 shall be made on or before the first day of each month beginning July 1 and continuing through February 1 for the regular inspection period; except that the Administration may require the full amount of advance payments prescribed by this paragraph to accompany the application of an applicant who has defaulted in any payment

due for any prior packing season.

(2) Whenever it is determined, without hearing, by the Administration that an establishment having the inspection service has been damaged by wind, fire, flood, or other calamity, to such an extent that packing operations cannot be resumed before the end of the fiscal year then current, no advance payments falling due after such calamity shall be required from the packer for that fiscal year; but whenever it is determined, without hearing, by the Administration that an establishment having the inspection service has been so damaged by any such calamity that operations must be suspended temporarily, but can be resumed before the end of the fiscal year then current, advance payments falling due after such calamity and before the month of resumption of operations shall be postponed until operations are resumed, and thereupon shall be paid in equal monthly installments during the period between the time of resumption of operations and June 1 of the fiscal year then current: *Provided*, That in the event of a determination described in this subparagraph the total payments and deposits made by the packer involved shall be charged with the cost of the service made available for the establishment without regard to the method provided hereinafter for computing charges against payments and deposits for shrimp received, and the balance of the total payments and deposits for shrimp received remaining after such charges shall be refunded by the Administration to the packer after the completion of the fiscal year.

(3) Each application for an extension inspection period of 1 month shall be accompanied by a payment of $600.00, and at subsequent monthly intervals thereafter additional payments of $600.00 shall be made; but if the final payment is to cover a period of less than 30 days, then such payment shall be at the rate of $20.00 for each day of such period.

(b) (1) In addition to the payments prescribed in paragraph (a) of this section, advance deposits based upon the quantity of shrimp received by the subscribing establishment shall be made to underwrite adequately the cost of the inspection service. Such deposits shall be paid in advance in amounts of not less than $300.00, unless the Administration on an estimate of receipt of shrimp authorizes other amounts, and shall be computed at the rate of 20 cents per 100 pounds of whole raw shrimp, or 35 cents per 100 pounds of raw headless shrimp, received by the plant. For the purposes of this section, the quantity of shrimp received by an establishment shall be determined by weighing on a suitable scale immediately after such shrimp leaves the initial inspection belt: *Provided, however*, That other arrangements for determining accurately the weight of shrimp received may be employed if approved in advance by the Administration. A record of such weights shall be maintained and made available to the inspector upon his request. Any advance deposits in excess of those required for actual shrimp received for the fiscal year (July 1 through June 30) shall be refunded to the packer by the Administration after the completion of the fiscal year.

(2) Deposits for shrimp received as computed under paragraph (b) (1) of this section, together with production deposits prescribed for oysters canned under § 85.28 (b) (1), shall be charged with the balance of the total cost of the inspection service that has not been provided for by the combined total payments under paragraph (a) of this section and paragraph (a) of § 85.28, in the case of canned oysters. The balance of the deposits remaining for shrimp received after such charges have been made shall be refunded by the Administration to the packers after the completion of the fiscal year, in the ratio which each packer's deposits for shrimp received and production deposits for oysters canned bears to the combined total of such deposits for shrimp received and oysters canned by all packers for the fiscal year.

(3) When inspection service is withdrawn from an establishment as authorized under § 85 14 (a), the Administration shall not return to the packer any advance payments and/or deposits required to the date of withdrawal of the service. Such payments and/or deposits shall be charged with the cost of the service made available for the establishment, without regard to the method described in this section, and the balance which would have accrued to such packer shall remain to the credit of the Food and Drug Administration in the special account "Salaries and Expenses, Certification and Inspection Services."

(c) A separate fee shall be paid to cover all expenses, incurred in accordance with the regulations of the United States Government, for salary, travel, subsistence, and other purposes incident to inspection described under § 85.4 (b) of suppliers of any materials to establishments under the inspection service or for the purpose of issuing a certificate or warehousing or export permit on processed shrimp stored or held at any place other than an establishment to which a sea food inspector is then assigned.

(d) When the processing plant and the warehouse or cold storage plant of an establishment are located at different points of such distance apart that transportation between them is required for the inspector to perform his duties in the establishment, the packer shall furnish such transportation or shall pay a separate fee to cover all expenses therefor.

(e) All payments required by the regulations in this part shall be by bank draft or certified check, collectible at par, drawn to the order of the Treasurer, United States, and payable at Washington, D. C. All such drafts and checks, except those for the payment required by § 85.1 (a), shall be delivered to the inspector and promptly scheduled to the Food and Drug Administration, Department of Health, Education, and

Welfare, Washington, D. C., whereupon after appropriate records thereof have been made, they shall be transmitted to the Chief Disbursing Officer, Division of Disbursement, Treasury Department, for deposit to the special account "Certification and Inspection Services, Food and Drug Administration."

(f) All refunds to the packers shall be by check drawn on the Treasury of the United States pursuant to refund vouchers duly certified and approved by the designated administrative officers.

§ 85 .14 *Suspension and withdrawal of inspection service.* (a) The Administration may suspend and the Secretary may withdraw inspection service in any establishment:

(1) Upon failure of the packer to comply with any applicable provision of §§ 85 .1 through 85 .14; or

(2) Upon the dissemination by the packer or any person in privity with him of any representation that is false or misleading in any particular regarding the application to any sea food of the inspection service provided by the regulations in this part.

(b) When inspection service is suspended in an establishment, as authorized by paragraph (a) of this section, the Administration shall not lengthen the inspection period in such establishment to compensate for any of the time of suspension.

APPENDIX "B"

BUREAU OF COMMERCIAL FISHERIES SOURCES
OF INFORMATION ON THE SHRIMP INDUSTRY

Statistics on the shrimp fisheries compiled and published regularly by the Bureau of Commercial Fisheries in the United States Fish and Wildlife Service are included principally in reports concerning all fisheries. Other published data provide members of the fishery industry and other interested persons with up-to-date marketing information. This information, while not always complete because of the Bureau's desire to keep the data current, can be considered representative of current trends in the fishery. More complete data, published on a monthly and an annual basis, form the basis for economic research and, at the same time, furnish valuable information for biological studies of shrimp populations.

Shrimp marketing information of current interest to the industry is published daily by several of the Bureau's Market News Offices. The data included in these reports pertain to daily landings of shrimp at principal fishing ports, daily wholesale prices at two principal distributing centers, daily and weekly movements and inventories of frozen products for specified areas, weekly canned packs, weekly imports from Mexico, monthly imports and exports by country of origin and destination. The Market News Offices issuing these reports are located in New Orleans, Louisiana; Hampton, Virginia; New York City, New York; Chicago, Illinois; Boston, Massachusetts; San Pedro, California; and Seattle, Washington.

The Bureau's Branch of Statistics publishes monthly and annual Shrimp Landings bulletins. These reports, first issued in January 1956, contain data on the quantity and value of the domestic landings of shrimp, by variety and size, in the States bordering the Gulf of Mexico. Beginning with July 1956 similar data for the States of the South Atlantic Region are being collected. An additional report on shrimp landings is available which includes detailed data on fishing trips and days fished as well as statistical tabulations of catches by species, size, depth of water where taken, and area of capture in the Gulf of Mexico. These reports are the first issued by the Bureau providing detailed coverage for a single species.

Additional statistical publications of the Bureau, which include information on shrimp, are the monthly and annual Fish Landings bulletins for the States of North Carolina, Georgia, Florida, Alabama, Mississippi, and Texas released in cooperation with the fishery agencies of the various states. The bulletins contain data on the quantity of shrimp landed, by coastal areas. The Texas report, in addition, includes data on the catch by gear and by waters. Two annual publications of the Service, South Atlantic Fisheries and Gulf Fisheries, include data on the catch and value, number of fishermen,

number of fishing craft, and quantity and type of fishing gear employed in the commercial fisheries of the two geographic regions. The Bureau's Frozen Fish report, published monthly and annually, includes the quantity of "headless" and "all other (including breaded)" shrimp frozen each month and held by cooperating cold storage warehouses on the last day of each month. This bulletin is preceded by a preliminary report released 15 to 20 days earlier. Manufactured Fishery Products, an annual summary, contains the production and value of the various processed commodities, including manufactured shrimp products, produced in the United States and its territories. The Canned Fish and By-Products report contains data on the annual production of canned (hermetically sealed and processed) products and by-products (shrimp included), and the number of plants producing these commodities. Packaged Fish is an annual report. It includes data on the production of consumer packaged products (packages containing 2 pounds or less) of two classifications of shrimp, "breaded" and "non-breaded".

An annual bulletin Imports and Exports of Fishery Products lists the quantity and value of fishery products imported and exported, by commodity classification. The bulletin includes data for the 5 most recent years. A monthly report on selected fishery imports, by country of origin, is also available.

Fisheries of the United States and Alaska is an annual summary containing statistics on the number of fishermen, number of fishing craft, type and quantity of gear, and volume and value of catch. A preliminary report is released each year shortly after the first of January, the final report being issued when the information available is more complete.

Fishery Statistics of the United States is an annual statistical digest which contains over 300 pages of detailed data on the fisheries. It incorporates information included in the various other annual statistical reports and in addition contains historical series on a number of major fisheries.

The various publications listed above--with the exception of the last-named statistical digest which may be obtained from the Superintendent of Documents, Government Printing Office, Washington D. C.--are mailed free of charge by the Bureau of Commercial Fisheries to interested persons.

SELECTED REFERENCES

Adams, Ernest, Klein, Marina, and Limerl, L. E.
1953 Packaging tests of glazed and unglazed shrimp. Quick Frozen Foods, vol. 15, no. 6, January, pp. 55-57.

Alford, John A. and Fieger, E. A.
1952 The non-microbial nature of the black spots on ice-packed shrimp. Food Technology, vol. 6, no. 6, June, pp. 217-219.

Bailey, M. E. and Fieger, E. A.
1955 Further experiments on the control of melanosis or "black spot" on shrimp. Proceedings of the Gulf and Caribbean Fisheries Institute, 7th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Butler, Chas., Slavin, J. W., Patashnik, M., and Sanford, F. B.
1956 Refrigeration of fish--Part One: Cold storage design and refrigeration equipment. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C., June. (Fishery Leaflet 427)

Canadian Fisherman
1954 Transporting shrimps in British Columbia. Vol. 41, no. 7, July, p. 22.

Campbell, L. Leon, Jr. and Williams, O. B.
1952 The bacteriological, chemical, and organoleptic changes with ice storage. The bacteriology of Gulf Coast shrimp - IV. Food Technology, vol. 6, no. 4, April, pp. 125-126.

Carlson, C. J. and Dassow, J. A.
1956 How to maintain quality of Alaska frozen shrimp. Pacific Fisherman, vol. 54, no. 2, February, p. 54.

Commercial Fisheries Review
1952 Recovery and palatability of different species of shrimp after cooking. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. vol. 14, no. 11, November, p. 12.

Crowther, H. E.
1952 Freezing shrimp at sea. Proceedings of the Gulf and Caribbean Fisheries Institute, 4th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, April.

1951 Control of fish spoilage by icing and freezing. Proceedings of the Gulf and Caribbean Fisheries Institute, 3rd Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, June.

Dassow, J. A., Pottinger, S. R., and Holston, J.
1956 Preparation, freezing, and cold storage of fish, shellfish, and precooked fishery products. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 430)

Divers, Earl L.
1953 Practical aspects of shrimp freezing. Proceedings of the Gulf and Caribbean Fisheries Institute, 5th Session, Marine Laboratory, University of Miami, Coral Gables, Florida, April.

Duggan, R. E.
1951 Detecting decomposition in shrimp and oysters. Southern Fisherman, 1951 Yearbook, vol. 11, p. 130.

Fagerson, I. S., Anderson, E. E., and Fellers, C. R.
1952 Meat content varies in frozen shrimp packages. Quick Frozen Foods, vol. 15, no. 3, October, pp. 15, 125.

Faulkner, Marian B., Walts, Betty M., and Humm, Harold J.
1954 Enzymatic darkening of shrimp. Food Research, vol. 19, no. 3, May-June, pp. 302-310.

Fieger, E. A.
1948 Fresh and frozen shrimp in refrigerated storage. Refrig. Res. Found., Bull. 48-2, 1-2 (Feb. 20, 1948). Food Technology, vol. 2, no. 3, July 1948, pp. 90-91.

1950 Problems in handling fresh and frozen shrimp. Food Technology, vol. IV, no. 10, October, pp. 409-411.

1951 The refrigeration of Gulf shrimp--cause, prevention of black spot. Quick Frozen Foods, vol. XIII, no. 8, March, pp. 114-115.

1952 Studies on black spotted shrimp. Proceedings of the Gulf and Caribbean Fisheries Institute, 4th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, April.

Fieger, E. A., Colmer, A. R., and Alford, J. A.
1950 Black shrimp and black spotted shrimp. Southern Fisherman, vol. X, no. 12, December, pp. 12, 23, 77.

Fieger, E. A. and DuBoise, C. W.
1948 Conditions affecting the quality of quick-frozen shrimp. Seafood Business, vol. 1, no. 4, November, pp. 12-14.

Fieger, E. A., Frilox, James J., and Norton, E. J.
1953 Causes of loss in weight of frozen packaged shrimp. Fishing Gazette, vol. 70, no. 4, April, p. 44.

Fieger, E. A. and Frilox, J. J.
1954 Comparison of objective tests for quality of fresh and frozen Gulf shrimp. Proceedings of the Gulf and Caribbean Fisheries Institute, 6th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Fieger, E. A., Green, M., Lewis, H., Holmes, D., and DuBois, C.
1950 Shrimp handling and preservation. Refrigeration Engineering, vol. 58, no. 2, March, pp. 244-247, 286, 288.

Food Industries
1950 Shrimp keep better if alkali treated. Vol. 22, no. 4, April, p. 117.

Green, Margaret
1949 Bacteriology of shrimp, I - introduction and development of experimental procedures. Food Research, vol. 14, no. 5, September-October, pp. 365-371.

Bacteriology of shrimp, II - quantitative studies on freshly caught and iced shrimp. Food Research, vol. 14, no. 5, September-October, pp. 372-383.

Bacteriology of shrimp, III - quantitative studies on frozen shrimp. Food Research, vol. 14, no. 5, September-October, pp. 384-394.

Bacteriology of shrimp, IV - Coliform bacteria in shrimp. Food Research, vol. 14, no. 5, September-October, pp. 395-400.

Higman, J. B.
1955 Behavior of shrimp in an electrical field. (Abstract). Proceedings of the Gulf and Caribbean Fisheries Institute, 7th Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Higman, J. B. and Idyll, C. P.
1953 Holding fresh shrimp in refrigerated sea water. Proceedings of the Gulf and Caribbean Fisheries Institute, 5th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, April.

Higman, J. B., Idyll, C. P., and Thompson, J.
1954 Further experiments in holdings of fresh shrimp in refrigerated seawater and ice. Proceedings of the Gulf and Caribbean Fisheries Institute, 6th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Holmes, Doris and McCleskey, C. S.
1949 Bacteriology of Shrimp, V - effect of peeling, glazing and storage temperature on bacteria in frozen shrimp. Food Research, vol. 14, no. 5, September-October, pp. 401-404.

Klein, M., Limerl, L. F. and Adams, E.
1954 Evaluation of five pound packages of glazed and unglazed shrimp. Proceedings of the Gulf and Caribbean Fisheries Institute, 6th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Lane, Charles E. and Whittaker, B. Edward
1953 Use of ultraviolet ("black") light for determining quality in iced shrimp. Marine Laboratory, University of Miami, Coral Gables, Florida, Special Service Bulletin No. 7, December.

1954 Proceedings of the Gulf and Caribbean Fisheries Institute, 6th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Mackenzie, R. T.
1952 What the Shrimp Association of the Americas is doing to promote quality control. National Fisheries Yearbook, National Fisheries Institute, Washington, D. C., pp. 61-62.

Quick Frozen Foods
1954 New glaze method cuts shrimp packing costs. Vol. 16, no. 9, April, p. 106.

Southern Fisherman
1952 Patent filed on keeping shrimp. Vol. XII, no. 6, June, p. 116.

Stansby, M. E., Pottinger, S. R., and Miyauchi, D. T.
1956 Factors to be considered in the freezing and cold storage of fishery products. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 429)

Strasburger, Lawrence W.
1955 Shrimp industry standards of quality, Southern Fisherman, vol. 15, No. 1, January, pp. 22, 47. Also in Proceedings of the Gulf and Caribbean Fisheries Institute, 7th Annual Session, Marine Laboratory, University of Miami, Coral Gables, Florida, September.

Williams, O. B.
1949 Microbiological examination of shrimp. Journal of Milk Food Tech., vol. 12, pp. 109-110.

1953 Food Science Abstracts, vol. 25, no. 1, January, p. 23.

Young, O. C. and Taylor, D. H.
1948 Experiments on the storage of frozen shrimp. Fisheries Research Board of Canada, Progress Reports of the Pacific Coast States, no. 74, March, pp. 3-5.

CHAPTER VIII

CONSUMPTION AND PRICES

ABSTRACT

IN PART, SHRIMP OWES ITS POPULARITY TO THE FACT THAT IT CAN BE SERVED IN A VARIETY OF DISHES, RANGING FROM APPETIZER, SOUP, AND SALAD TO ENTREE. IN RECENT YEARS, THE BREADED SHRIMP DINNER HAS VIED IN POPULAR ACCEPTANCE WITH THE SHRIMP COCKTAIL.

AMONG OTHER FACTORS ACCOUNTING FOR THE STRONG DEMAND FOR SHRIMP IS ITS FLAVOR AND HIGH NUTRITIVE VALUE AS THE RESULT OF HIGH PROTEIN AND LOW FAT CONTENT.

TOTAL UNITED STATES CONSUMPTION OF SHRIMP AND SHRIMP PRODUCTS IN 1958 WAS APPROXIMATELY 164 MILLION POUNDS ON AN EDIBLE WEIGHT BASIS. ON A PER CAPITA BASIS, CONSUMPTION WAS APPROXIMATELY ONE POUND IN EDIBLE WEIGHT, THE CATCH EQUIVALENT AMOUNTING TO TWO POUNDS. AT THE PRESENT TIME, ABOUT 1 IN EVERY 11 POUNDS OF FISH AND SHELLFISH PRODUCTS SERVED AT THE TABLE IS SHRIMP.

SHRIMP CONSUMPTION IN THE FUTURE PROBABLY WILL EXCEED LEVELS TO BE EXPECTED AS THE RESULT OF NORMAL POPULATION GROWTH, SINCE AT LEAST SOME OF THE FACTORS WHICH HAVE BROUGHT ABOUT THE INCREASE IN THE DEMAND FOR SHRIMP IN THE LAST TWO DECADES ARE LIKELY TO CONTINUE TO PREVAIL IN THE MARKET. SUPPLY PROBLEMS MAY PLACE AN UPPER LIMIT ON THE SIZE OF ANY SUCH INCREASE IN CONSUMPTION.

PRICE INFORMATION ON SHRIMP AND SHRIMP PRODUCTS IS AVAILABLE FROM A VARIETY OF SOURCES. THE MARKET NEWS SERVICE, BUREAU OF COMMERCIAL FISHERIES, OF THE UNITED STATES FISH AND WILDLIFE SERVICE COLLECTS EX-VESSEL AND WHOLESALE PRICE DATA; THE UNITED STATES BUREAU OF LABOR STATISTICS PUBLISHES WHOLESALE PRICE INFORMATION ON SELECTED FRESH AND FROZEN SHRIMP ITEMS FOR TWO CONSUMPTION CENTERS; SUBDIVISIONS OF STATE AND MUNICIPAL AGENCIES GATHER RETAIL PRICE INFORMATION. IN ADDITION TO SUPPLY AND DEMAND FACTORS, THERE ARE OTHER IMPORTANT VARIABLES WHICH INFLUENCE PRICE; AMONG THESE ARE GEOGRAPHIC LOCATION, SPECIES, SIZE CLASS, PRESENCE OF LABOR UNIONS IN THE MARKET, AND PROCESSOR CONTROL OF FISHING OPERATIONS.

INCLUDED IN THE ANALYSIS IN THIS CHAPTER ARE STUDIES OF SPREADS BETWEEN PRICES AT SUCCESSIVE STAGES OF DISTRIBUTION, COMPARISONS OF SHRIMP PRICE-INDEX SERIES WITH OTHER PRICE-INDEX SERIES, AS WELL AS STATISTICAL RELATIONSHIPS OF QUANTITY AND VALUE OF LANDINGS, AND VALUE OF LANDINGS AND PERSONAL INCOME.

CONSUMPTION PATTERNS

Forms in Which Shrimp are Consumed

Shrimp is one of the most popular fishery items on household and restaurant menus. In part, this popularity is based on the variety of dishes that can be prepared from it. Shrimp first found favor nationally in shrimp cocktails as an hors d'oeuvre de luxe. Today more and more shrimp is being consumed in entree form.

A consumer survey conducted some years ago in the city of Rochester, New York, established that 35 percent of the respondent consumers served "sea food"--under which term oysters, shrimp, clams and other shellfish and crustaceans, were included--in cocktail form; the percentages of consumers serving such "sea food" in steamed, fried, or other forms commonly used for preparation of complete meals were smaller. Because of the leading position of shrimp in the "sea food" line, the data gave some indication of the relative popularity of the various forms in which shrimp was then being consumed. The increased production in recent years of frozen packaged, and in particular of frozen breaded, shrimp products which ordinarily are served as the main dish may have changed this picture to some extent.

Consumption in Households

In a study of fish and shellfish preferences of household consumers made by the United States Fish and Wildlife Service in 1951, it was found that shrimp was the variety of shellfish most generally served. In the year for which data were obtained shellfish products were served in about 20 percent of the households in this country.

Of the users of frozen shellfish, over 70 percent served frozen shrimp. Fresh shrimp was used by more than 50 percent of the consumers of fresh shellfish. A similar proportion of the users of canned shellfish bought canned shrimp.

A recent study of breaded shrimp consumption among household consumers indicated that frozen breaded shrimp was used by about one homemaker in five. More consumers bought uncooked in preference to the cooked product.

Breaded shrimp was used by families in all income groups, although consumption was greater in the upper income groups.

In general, consumption of breaded shrimp tended to increase moderately in relation to size of household.

The results of the study on breaded shrimp consumption also indicated that young housewives bought breaded shrimp more often than older homemakers; and that, in general, consumption of this product was higher among white-collar occupations than among occupations requiring manual skills.

Consumption in Public Eating Places

Restaurants specializing in serving fish meals as well as other eating places are important users of shrimp.

The great popularity of shrimp dishes in restaurants was indicated by a survey of fish and shellfish consumption in public eating places (covering a 1-week period during May 1955) recently completed by the United States Fish and Wildlife Service. This survey disclosed that 83 percent of the restaurants, 86 percent of the cafeterias and 92 percent of restaurants and cafeterias in hotels served fish and shellfish. From the data obtained it was estimated that during the survey week the more than 208,000 public eating places which served fish and shellfish (table VIII -20) purchased 528,800 pounds of fresh shrimp at a cost of $394,100 and 1,846,100 pounds of frozen shrimp at a cost of $1,472,100.

TABLE VIII - 20.--QUANTITY, VALUE, AND PRICE PER POUND, OF FRESH AND FROZEN SHRIMP PURCHASED BY PUBLIC EATING PLACES, DURING A 1-WEEK PERIOD IN MAY 1955 BY GEOGRAPHIC REGION

Region	Fresh Shrimp 1/			Frozen Shrimp		
	Quantity	Value	Unit value	Quantity	Value	Unit value
	Thousand pounds	Thousand dollars	Cents per pound	Thousand pounds	Thousand dollars	Cents per pound
United States Total	528.8	394.1	74.5	1,846.1	1,472.1	79.7
Northeast	217.9	177.4	81.4	552.4	439.8	79.6
North Central	53.1	48.8	91.9	558.3	449.3	80.5
South	249.2	157.9	63.4	421.1	323.3	76.8
West	8.6	10.0	116.3	314.3	259.7	82.6

1/ Including bulk-frozen shrimp thawed before being offered for sale.

A review of a sample of daily menus obtained from 110 public eating places in New York City revealed that shrimp dishes were served in 46 of them. Of the latter establishments, 12 served shrimp as a main dish only, 12 served shrimp cocktails only, and 13 offered both shrimp cocktails and main dishes. A tabulation made from 43 menus of public eating places in the Cleveland, Ohio area of which 21 served shrimp showed that both shrimp cocktails and main dishes were served in 12 public eating places, while 9 other establishments offered shrimp as a main dish only.

NUTRITIVE VALUE

Shrimp possess the same general food properties that are commonly attributed to fishery products. In general, marine products are an excellent and economic source of highly digestible proteins, a good source of vitamins, and an excellent source of minerals in both quantity and variety.

Shrimp combine low fat with high protein content. Since proteins are used by the body to build and repair tissues and produce enzymes, shrimp are ideally suited for inclusion in weight reduction diets, provided they are eaten without calorie-rich sauces or condiments.

Chemical analyses performed by the Fishery Technological Laboratory of the United States Fish and Wildlife Service, Bureau of Commercial Fisheries, at College Park, Maryland, as well as by the United States Department of Agriculture, have shown that the approximate composition of various end-products of shrimp is as follows:

TABLE VIII - 21.--CHEMICAL COMPOSITION OF SELECTED SHRIMP PRODUCTS

Item	Percent by weight			
	Dry matter	Protein	Fat	Mineral matter
Freshly boiled 1/	28.8	26.0	0.4	2.0
Frozen precooked and peeled (purchased as such)	28.9	26.5	0.5	2.0
Canned, dry packed	32.3	25.5	0.8	2.9
Canned, brine packed	24.3	20.0	0.5	1.9

1/ Shrimp were purchased frozen and simmered for five minutes in water containing 1/4 cup salt per quart.

A serving portion of about 100 grams (about 3-1/2 ounces), on the basis of this breakdown, will contain on the average 110 calories.

Analyses conducted for the United States Fish and Wildlife Service by Food Research Laboratories, Inc., Long Island City, New York, show that fresh and frozen shrimp contain a fair amount of a number of important vitamins.

Vitamin content, as established by this laboratory, is shown in table VIII - 22.

TABLE VIII -22.--VITAMIN CONTENT OF FRESHLY BOILED AND FROZEN PRECOOKED SHRIMP

Vitamin	Per 100 gram serving	
	Freshly boiled	Frozen precooked
Thiamine, milligrams	1.3	1.7
Riboflavin, "	0.041	0.039
Niacin, "	2.5	1.5
Folic acid, "	0.041	0.032
Vitamin B_{12} activity, micrograms	1.3	1.7

The vitamin content of canned shrimp is very similar with the exception that most of the thiamine is destroyed in processing.

The mineral matter--which amounts to about 2 percent by weight, or about 600 milligrams per ounce, in cooked shrimp--includes just about every mineral element in the sea. R. A. McCance and E. M. Widdowson in their book, The Chemical Composition of Foods, give the following data for the nutritively essential minerals of shrimp expressed in milligrams per ounce: calcium, 91; phosphorus, 77; iron, 29.8; and copper, 0.23. In general, it appears that shrimp contain in reasonable quantities all of the mineral elements needed to build strong bones and teeth, and normal blood constituents.

The sodium content which comes from the brine in which the shrimp are cooked is 1090 milligrams per ounce. This factor must be taken into consideration in devising a diet for persons who have to keep their sodium intake at a low level.

Freshly cooked shrimp contain about 450 parts per billion iodine. Sometimes shrimp have a rather pronounced iodoform taste caused by marine organisms upon which the shrimp fed.

Table VIII - 23 compares the composition of various shrimp products with that of other important protein-containing foodstuffs.

A publication of the Fish and Wildlife Service, Composition of Cooked Fish Dishes (Circ. 29) indicates the food value of various shrimp dishes. Table VIII - 24 has been reproduced from this publication.

TABLE VIII -23.--ANALYSES AND FOOD VALUES OF SHRIMP AND CERTAIN OTHER FOODSTUFFS

(Calculated on the fresh basis)

Constituents	Shrimp (edible portion)				Other foods (edible portion)							
	Cooked	Canned (dry packed)	Canned (wet packed)	Dry	Scallops	Oysters shucked	Canned salmon	Fresh halibut	Whole egg	Beef steak (lean)	Whole milk	American cheese
	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent	Per-cent
Protein	27.6	25.5	20.0	71.4	14.8	6.2	21.8	18.6	13.4	21.3	3.3	28.8
Carbohydrates	-	-	-	-	3.4	3.7	-	-	-	-	4.0	-
Fat	1.0	0.8	0.5	5.0	-	1.2	12.1	5.2	10.5	7.9	5.0	35.9
Water	64.5	67.7	75.7	12.5	80.3	86.9	63.5	75.4	73.7	70.0	87.0	31.6
Salt	4.8	2.9	1.9	6.8	-	-	1.0	-	-	-	-	1.7
Comparative fuel value per pound (calories)	559	505	395	1,540	345	235	915	565	720	730	325	2,055

Source: United States Department of Agriculture, Bulletin No. 538.

TABLE VIII - 24.--CHEMICAL COMPOSITION OF SHRIMP DISHES

Recipe number and description of dish	Number of analyses	Per 100 grams: Moisture	Protein	Fat	Carbohydrate	Ash	Food energy	Per serving portion: Portion	Protein	Fat	Carbohydrate	Food energy
		Grams	Grams	Grams	Grams	Grams	Calories	Grams	Grams	Grams	Grams	Calories
Fresh, frozen or canned												
138 Curried shrimp	4	74.0	9.9	4.2	10.4	1.5	120	220	21.8	9.3	22.9	260
139 French fried shrimp	1	54.2	20.4	12.5	11.1	1.8	240	75	15.3	9.4	8.3	180
140 French fried shrimp in batter	2	60.4	21.1	9.6	7.0	1.9	200	75	15.8	7.2	5.3	150
141 Green pepper stuffed with shrimp	2	79.9	10.4	2.6	5.4	1.7	85	150	15.6	3.9	8.1	135
142 Shrimp a la king	4	71.9	12.5	5.2	8.7	1.7	130	145	18.1	7.5	12.6	190
143 Shrimp and apple salad	2	73.9	7.4	11.2	5.7	1.8	155	120	8.9	13.4	6.8	185
144 Shrimp au gratin	4	66.3	15.4	9.8	6.2	2.3	175	130	20.0	12.7	8.1	225
145 Shrimp au gratin with tomato juice	4	67.8	14.9	8.5	6.5	2.3	160	130	19.4	11.1	8.4	210
146 Shrimp bisque	3	78.4	9.9	6.2	3.9	1.6	110	210	20.8	13.0	8.2	235
147 Shrimp canapes	3	59.5	13.9	6.0	17.9	2.7	180	30	4.2	1.8	5.4	55
148 Shrimp casserole	4	71.9	11.3	7.6	7.1	2.1	140	140	15.8	10.6	9.9	200
149 Shrimp creole	6	79.2	6.2	2.8	10.2	1.6	90	240	14.9	6.7	24.5	220
150 Shrimp in tomato aspic	3	83.9	11.3	0.9	1.8	2.1	60	130	14.7	1.2	2.3	80
151 Shrimp Jambalaya	3	79.7	7.7	2.5	8.6	1.5	90	240	18.5	6.0	20.6	215
152 Shrimp kabobs	2	69.6	22.1	5.1	-	3.1	135	80	17.7	4.1	-	110
153 Shrimp meuniere	1	57.3	24.2	16.1	-	2.5	240	60	14.5	9.7	-	145
154 Shrimp mousse	2	76.1	10.9	8.9	2.5	1.6	135	135	14.7	12.0	3.4	180
155 Shrimp Newberg	2	66.5	15.4	11.8	4.5	1.8	185	110	16.9	13.0	4.9	205
156 Shrimp salad	5	74.0	15.2	6.4	2.6	1.8	130	100	15.2	6.4	2.6	130
157 Shrimp sauce	1	74.9	9.8	3.7	9.7	1.9	110	80	7.8	3.0	7.8	90
158 Shrimp thermidor	2	72.9	14.0	6.7	4.3	2.1	135	150	21.0	10.1	6.5	205
159 Shrimp turnovers	3	34.1	14.6	19.5	28.5	3.3	350	20	2.9	3.9	5.7	70
160 Shrimp wiggle	2	71.9	11.1	5.4	9.8	1.8	130	160	17.8	8.6	15.7	211
161 Tomatoes stuffed with shrimp	2	81.1	8.5	2.7	6.0	1.7	80	150	12.8	4.1	9.0	120

STATISTICS ON APPARENT CONSUMPTION

Apparent consumption or 'disappearance' of food products over a period of time is calculated by adjusting production statistics by the net changes in foreign trade and inventories.

Shrimp consumption can be expressed either in round or edible weight terms. In the tables and graphs, edible weight statistics have been used to facilitate comparison with other food products. The conversion of the data to an edible-weight, raw-peeled basis in the case of shrimp is an easy one, since raw-peeled shrimp products weigh approximately half as much as their heads-on catch equivalents.

Trend in Apparent Consumption (Edible Weight)

The gain in popularity of shrimp in the American diet is portrayed by the statistics on apparent consumption in table VIII - 25.

Consumption of shrimp on an edible-weight basis was 51.2 million pounds in 1930 and over three times that amount, i.e., 169.5 million pounds in 1955. Expressed on a per capita basis, this represents an increase from four-tenths of a pound to about one pound (see table VIII -26).

Comparison of Per Capita Consumption With Other Protein Foods

Table VIII - 27 compares the trend in shrimp consumption to trends in consumption of shellfish; fish and shellfish; meat, fish and poultry; eggs and all food. In 1930 shrimp represented less than 4 percent of the per capita consumption of fish and shellfish, whereas in recent years it has represented about 9 percent.

1975 Consumption Requirements

A brief discussion of some of the factors of demand and supply may provide an approximate answer to the amount of shrimp needed in the domestic market of 1975.

An estimate of demand can be obtained by making projections of the United States population and per capita consumption rates.

The population forecasts of the United States Bureau of the Census for the year 1975 range from 207 to 228.5 million (including armed forces overseas--see table VIII - 28). If growth continued at current rates, the population of this country would be approximately 221.5 million in 1975.

TABLE VIII - 25.--APPARENT CONSUMPTION (HEADS-OFF AND HEADS-ON AND EDIBLE WEIGHT EQUIVALENTS) OF SHRIMP, SPECIFIED YEARS

(Expressed in thousands of pounds)

Item	1930	1940	1950	1951	1952	1953	1954	1955	1956	1957	1958 1/
Catch (heads-off)	54,935	90,927	113,927	133,468	135,196	154,912	159,659	143,360	133,383	121,293	124,474
Imports	6,040	5,024	40,197	41,823	38,471	43,100	41,519	53,772	68,618	69,732	85,394
Beginning stocks	n.a.	3,507	16,469	25,652	27,552	15,390	26,390	32,184	22,665	23,389	31,225
Total	60,975	99,458	170,593	200,943	201,219	213,402	227,568	229,316	224,666	214,414	241,093
Exports	-	4,236	2,153	2,892	3,154	2,887	3,591	4,759	4,071	4,125	3,809
Ending stocks	n.a.	7,422	25,652	27,552	15,390	26,390	2/32,184	22,665	23,389	31,225	41,684
Apparent consumption (heads-off)	60,975	87,800	142,788	170,499	182,675	184,125	191,793	201,892	197,206	179,064	195,600
Apparent consumption (heads-on equivalent 3/)	102,438	147,504	239,884	286,438	306,894	309,330	322,212	339,179	331,306	300,828	328,608
Apparent consumption (edible weight equivalent 4/)	51,219	73,752	119,942	143,219	153,447	154,665	161,106	169,589	165,653	150,474	164,304

1/ Preliminary.
2/ Includes raw peeled shrimp
3/ Heads-off weight multiplied by 1.68
4/ Heads-on weight divided by 2.
n.a. - Not available.

TABLE VIII - 26.--PER CAPITA CONSUMPTION OF SHRIMP, SPECIFIED YEARS

Year	Apparent consumption (edible weight)	Population 1/	Per capita consumption (edible weight)
	Thousand pounds	Millions	Pounds
1930	51,219	123.1	.416
1939	72,456	130.9	.554
1940	73,752	132.0	.559
1945	96,160	132.5	.726
1950	119,942	151.2	.793
1951	143,219	153.4	.934
1952	153,447	155.8	.985
1953	154,665	158.3	.977
1954	161,106	161.2	.999
1955	169,589	164.3	1.032
1956	165,653	167.3	.990
1957	150,414	170.3	.883
1958	164,304	173.3	.948

1/ Does not include armed forces overseas.

TABLE VIII - 27.--PER CAPITA CONSUMPTION OF SHRIMP COMPARED WITH CERTAIN OTHER PROTEIN FOODS, SPECIFIED YEARS

Year	Fresh and frozen shrimp	Total all fish and shellfish	Meats (carcass weight)	Eggs	Total food
	Pounds	Pounds	Pounds	Pounds	Pounds
1930	.4	10.3	129.0	40.2	1,555
1940	.6	10.6	142.4	38.7	1,568
1950	.8	11.6	144.6	50.0	1,525
1951	.9	11.1	138.0	50.7	1,517
1952	1.0	11.0	146.0	50.7	1,517
1953	1.0	11.4	155.3	49.3	1,518
1954	1.0	11.3	154.7	48.9	1,514
1955	1.0	10.4	162.8	48.2	1,514
1956	1.0	10.2	166.7	47.8	1,518
1957	.9	10.1	159.0	46.8	1,502
1958 1/	.9	10.4	152.1	45.6	1,490

1/ Preliminary.

A projection of per capita consumption of shrimp 20 years hence is less easy to obtain. Extrapolation of the trend over the past decades fails to provide a realistic answer. If per capita consumption were to double during the next two decades, as it did during the last two decades, a total of 830 to 920 million pounds (heads-on) of shrimp would be required to satisfy the requirements of the domestic market.11/ This quantity would correspond to the bulk of the world catch at the present time. Since supply is controlled by nature, discovery of extensive new grounds, as well as greatly intensified exploitation of presently known resources, would have to take place before the required quantity would be available in the domestic market. Exploitation of grounds currently fished by the domestic fleet is at a rate which cannot be increased without at least some long-term damage to the species. Exploration of waters within easy access to the typical shrimp boat will reach a stage of diminishing returns before long. Since the prospects of a sizable expansion of domestic production do not appear very bright, imports would have to be increased tremendously to meet the domestic supply deficit at a level of consumption of 830 to 920 million pounds.

TABLE VIII - 28.--SHRIMP SUPPLY REQUIREMENTS IN 1975

(Heads-on basis)

	1975 Population projection (Thousands)	Projected supply requirements (Millions of pounds)		
		(Per capita consumption 2 lbs.)	(Per capita consumption 3 lbs.)	(Per capita consumption 4 lbs.)
Census population estimate 1/				
AA	228,463	457	685	914
A	221,522	443	665	886
B	214,580	429	644	858
C	206,907	414	621	828

1/ The Census population estimates are based on differing assumptions with respect to future birth, mortality, and net immigration rates.

11/ This estimate was made by staff members of the Bureau of Commercial Fisheries in 1956. It uses 1955 as the base year. The estimate is arrived at by extending the 1975 population estimates by four pounds which is double the current per capita consumption rate. The edible weight equivalents of the above figures can be obtained by dividing by 2.

The statistics on the shrimp fisheries abroad included in Special Scientific Report - Fisheries No. 235 and No. 254 indicate (1) that the possibilities of substantially boosting production in the countries -- Mexico and the other Latin American countries -- which in the past have furnished the bulk of our imports are limited, and (2) that some of the fisheries in distant lands, especially in India, have not yet reached the limits of their potential. The success of making up domestic supply deficits will depend on whether enough shrimp of a quality and at a price acceptable to the American consumer can be imported.

While supply places an upper limit on future consumption, there seems to be little doubt that the requirements of the domestic market in 1975 will be substantially above the 339 million pounds (heads-on) of shrimp consumed in 1955. Assuming that current growth rates are maintained and that per capita consumption remains stable, population growth alone would raise supply requirements to the 450 million pound level.

There is reason to believe that per capita consumption will increase though at a considerably slower rate.

Harden Taylor (1951) comparing the markedly different economic conditions affecting the consumption of oysters and shrimp points out some of the factors stimulating the demand for shrimp:

"When judged by all the standards of measurement of a species that we have, the shrimp appears to have many advantages: being a luxury delicacy item, its price is not determined by bare competition as a staple item of food; it is easily subject to economical mass capture; its net edible portion is a high percentage of the total weight; it requires little in the way of preparation for market and that not expensive; it is well adapted to canning and freezing, as well as to the fresh fish market; it can be prepared for the table in many ways . . . "

The palatability of the frozen product accounts for the fact that shrimp was one of the species that benefited most during the last three decades from the development of frozen food processing. As a result, shrimp was introduced in many markets where it was previously unknown.

An indication of the spread in the area of distribution of shrimp products can be obtained on the basis of a study by the United States Fish and Wildlife Service of the sales patterns of fishery products in the more important consumption centers of this country. This study was first undertaken in 1936 and repeated in 1946. 12/ The results of the survey indicated that shrimp products in 1946 were much more

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12/ Kahn, R. A. and Stolting, W. H., Sales Patterns for Fresh and Frozen Fish and Shellfish 1936 and 1946, Fishery Leaflet 365, Fish and Wildlife Service, United States Department of the Interior, 1949.

widely distributed than 10 years earlier. Stolting, in 1951, 13/ listed 23 cities in which shrimp products were distributed in volume in 1946, but not in 1936. The geographic expanse of the "shrimp marketing belt" in 1946, as presented in figure VIII - 21 on the basis of the sales pattern data, extended from Tucson, Arizona, to Savannah, Georgia, and from Salt Lake City, Utah, to Washington, D. C. Although figure VIII - 21 relates to all varieties of fish and shellfish taken in the Gulf Area, it can be considered representative of shrimp distribution. Shrimp accounted for over one-half of the leading ranks reported for all Gulf Area varieties by the distributors who cooperated in the preparation of the sales pattern studies. 14/

Broader distribution--as consumption spreads to markets where shrimp has been comparatively unknown--may continue to be one of the principal factors asserting a positive influence on per capita consumption. The fact that shrimp has no direct substitute among fishery products and is not greatly dependent on the prices of competitive products makes its demand similar to other luxury class food items. Rising consumer incomes have constituted an important stimulus to increased consumption.

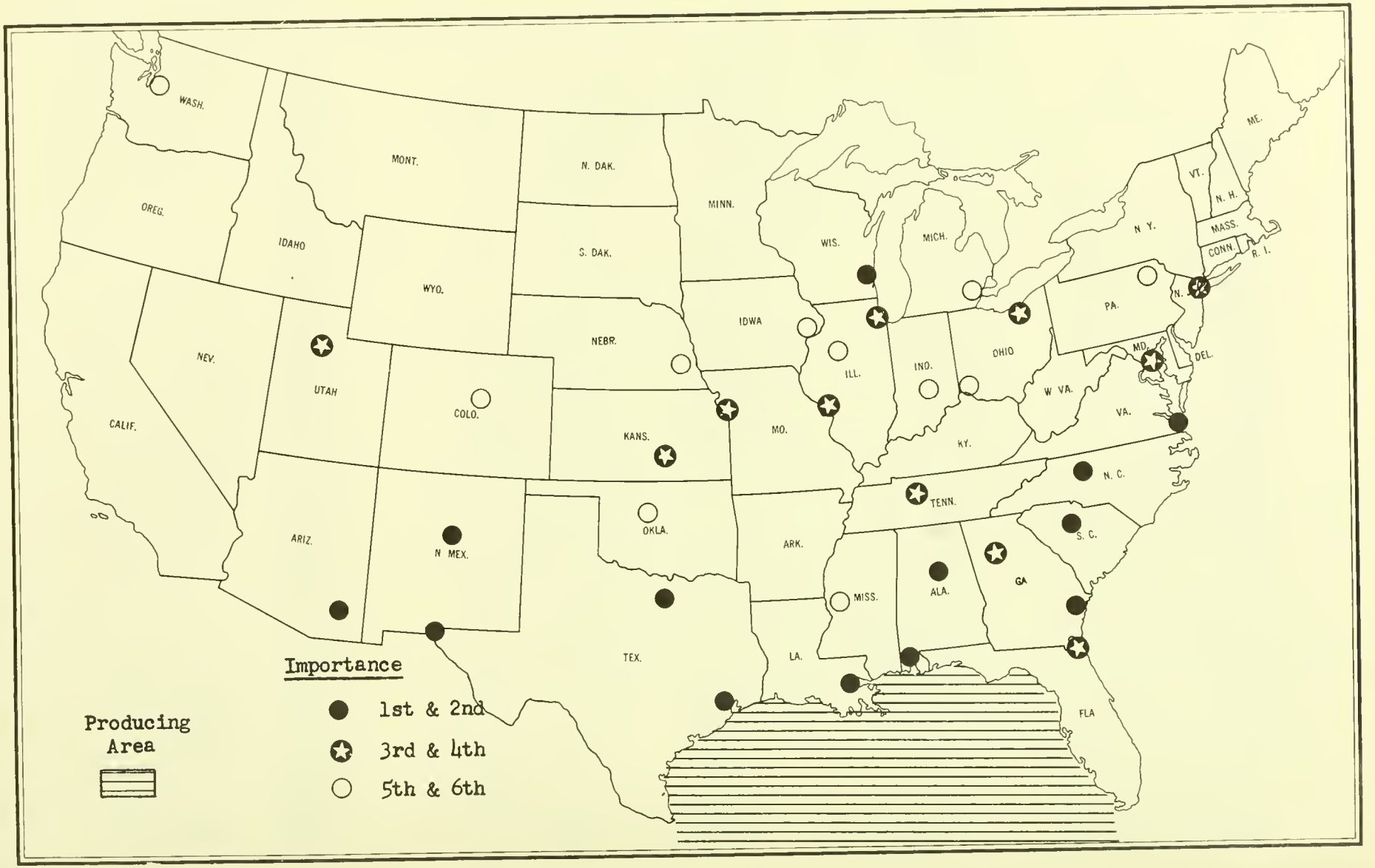
Despite shrimp's unique status among fishery products, its demand is related in broad terms to the demand for other luxury foods. The price relationship between shrimp and other luxury items will continue to exert an influence on consumption. There is always a chance that consumers may substitute lobster, crab, or fancy meat cuts for shrimp if the price ratio becomes too great.

Provided that prices remain on a reasonable level, per capita consumption of shrimp should continue to increase. Intelligent promotional efforts designed to open new markets and the possibility of rising consumer income, are the underlying reasons for this optimistic conclusion. Supply requirements in 1975 should be well above the lower limit of 450 million pounds indicated by population growth but, because of supply limitations, below the upper limit of 850 million pounds indicated by the projection of past consumption trends.

13/ Stolting, W. H., Some Economic Aspects of the Southery Shrimp Fishery, Proceedings of the Gulf and Caribbean Fisheries Institute, 4th Annual Session, 1952.

14/ The data for the sales pattern studies were developed by questionnaire interviews of local distributors in the markets selected for the sample. The distributors were asked to rank the six varieties of fish and shellfish most important from the standpoint of their business.

FIGURE VIII - 21.--DISTRIBUTION OF GULF STATES VARIETIES OF FRESH AND FROZEN FISH AND SHELLFISH, 1946



PRICES

Ex-Vessel Prices

Prices paid to fishermen, commonly referred to as ex-vessel prices, are established in several ways. In many instances, prices are agreed upon between the boat operators and the buyers before the boats leave port. In some localities the level of ex-vessel prices at one time was influenced by minimum prices stipulated by fishermen's unions or associations. Individual buyers frequently set a price for the shrimp catch before the boats leave port, but there is no formal contract.

While ex-vessel prices at all producing centers reflect the price level in the Chicago and New York wholesale markets, there is considerable variation in different localities. This is due to buyers in one location assuming costs or performing operations that buyers in other areas do not.

Since the species and size of the shrimp have a bearing on price in an area, variations will also depend on the abundance of the species and size counts. Even shrimp of like species and size sold in the same market may bring different prices depending upon the condition of the product and the reputation of the seller for proper handling and quality control.

It is difficult to construct a representative index of ex-vessel prices. The general trend in prices can be studied on the basis of a series of average values per pound at the fisherman's level. These prices may be obtained by dividing annual catch values by landings.

Average Value Per Pound Ex-Vessel

In figure VIII - 22 the average value of a pound of shrimp is compared with the average value per pound of all other varieties of fish and shellfish for representative years from 1930 to 1958. While the two values were identical in 1930, in 1958 shrimp were more than five times as valuable as the other varieties of fish and shellfish.

The ex-vessel value of shrimp in 1958 was 34.89 cents per pound as against 3.39 cents in 1930. Other fish and shellfish brought the fisherman an average 6.59 cents per pound in 1958. The latter were about twice as much as in 1930 compared to a tenfold increase in the price of shrimp.

Minimum Ex-Vessel Sharing Prices 15/

Quotations of minimum ex-vessel sharing prices have been compiled from the annual reports of the Bureau of Commercial Fisheries, Market News Service. The quotations are primarily for markets where a semblance of an 'administered' price is maintained; i.e., for

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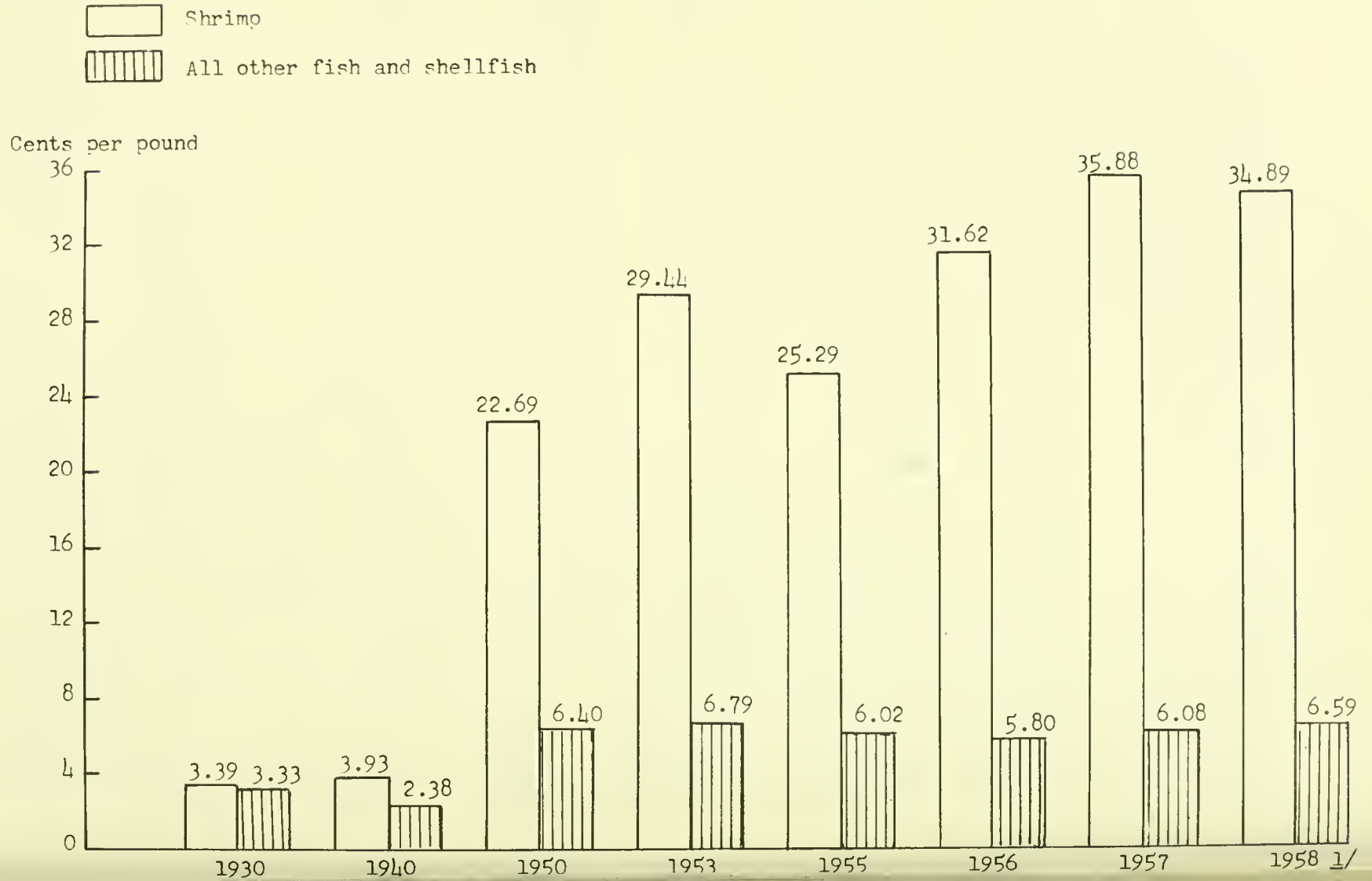
15/ In areas with relatively strong labor organization activity, unions sometimes participate in negotiating minimum ex-vessel prices. These prices, as a rule, become the basis for the distribution of the lay within the local market area and are referred to as minimum ex-vessel sharing prices.

FIGURE VIII - 22.--AVERAGE EX-VESSEL RECEIPTS PER POUND

LANDED SHRIMP AND ALL OTHER FISH AND SHELLFISH, SPECIFIED YEARS



locations where union activity has resulted in negotiated prices between fishermen, vessel owners, and shrimp buyers. While actual prices paid to the fishermen may differ from the minimum, the prices tabulated may be considered indicative of the general trend in the specific market. Even where the unions are strong, the efforts to impose uniform prices are not completely successful with prices fluctuating, in some instances as much as 10 percent in 1 week.

The union's price negotiators watch developments in the market and try to obtain an upward adjustment when warranted by favorable conditions. When consumer demand drops, there is a natural reluctance on the part of the union to accede to a downward adjustment. According to the Bureau of Business and Economic Research of the University of Miami, union activity has a stabilizing effect on price.

Variations in minimum ex-vessel sharing prices prevailing in different geographic locations, for different species, and different size classes, as well as the general trend in ex-vessel sharing prices over the period for which data have been collected, are shown in the tabulations below. The comparisons must be interpreted with some caution since minimum sharing prices are not necessarily identical with prices actually negotiated.

Geographic variations.--Throughout 1952 and the first 2 months of 1953 fishermen in the Morgan City, Louisiana, Area obtained a higher price for similar count shrimp than the Brownsville, Texas, fishermen. In the latter part of 1953 the positions of the fishermen in the two areas were reversed with Brownsville fishermen receiving three cents more per pound. In 1954, minimum sharing prices encountered in the two areas were similar.

TABLE VIII - 29.--MINIMUM EX-VESSEL SHARING PRICES IN MORGAN CITY, LOUISIANA, AND BROWNSVILLE, TEXAS AREAS, 1952, 1953, AND 1954

(All varieties, 26-30 count, heads-off)

(Cents per pound)

Month	1952		1953		1954
	Morgan City	Brownsville	Morgan City	Brownsville	Morgan City and Brownsville
January	32	30	44	40	46
February	33	30	46	40	44
March	36	35	48	48	44
April	36	35	50	50	38
May	36	35	52	52	38
June	36	37	52	52	38
July	41	37	44	44	30
August	41	37	44	47	30
September	41	37	44	47	30
October	41	37	44	47	30
November	41	37	44	47	30
December	42	40	44	47	30

Variations between species.--Fragmentary data indicate that price differentials between white and grooved shrimp exist in most landing ports. 16/ In 1952 grooved shrimp (26-30 count) in the Morgan City, Louisiana, area sold from 4 to 10 cents less per pound than white shrimp of similar count. In Bayou LaBatre, Alabama, no price differential existed between similar count shrimp of different species, with the exception of the last few months of the year. The same characteristic distinction between the two ports existed in 1951 (see table VIII - 30). A possible explanation for the absence of a differential in Alabama and Mississippi ports (see also the 1950 data for Biloxi, Mississippi) is that most of the shrimp landed in these states were used for canning. There is little consumer resistance against shrimp canned from the grooved varieties.

Variations between size classes.--Differentials between different size classes of shrimp (all varieties and areas combined) are shown in table VIII - 31. In 1948 quotations for three size classes were collected: larger than 25 count, 26-35 count, and smaller than 36 count. The differential between the size classes amounted to twenty cents, and 12 cents respectively. At the end of the year the differential between the larger classes had been reduced to 12 cents. In 1949 the Market News Office started to collect quotations for five size classes in some areas; i.e., less than 20, 21-25, 26-30, 31-42, and 36 plus. In the 1954 Brownsville and Morgan City union agreements the low-count shrimp were broken into two classes; viz., 15 and under and 15-20 count. Collected data show that the differentials between the size classes do not remain constant. In 1954 the differentials between the 15-20 and 21-25 and between the 21-25 and 26-30 size classes fluctuated between 4 and 6 cents, while the difference between 26-30 and 31-42 count shrimp was 10 cents at the beginning, and 3 cents at the end of the year. Because of the unfavorable market conditions during 1954 quotations for high-count shrimp, when any were made at all, were nominal (8 cents in the months of April through June).

Average minimum ex-vessel sharing prices (26-30 count for all varieties and locations considered).--From the available data monthly average prices for the 26-30 count of all varieties and all locations have been computed (see table VIII - 32). The series is used for comparison with similar composite series of wholesale and retail prices.

16/ After the price comparisons made in the balance of this section on ex-vessel prices were made, more voluminous price information became available through an expanded shrimp statistics program of the Bureau of Commercial Fisheries. Since the prices here tabulated are illustrative of the subjects discussed, this section was not revised in order to avoid delay in issuing this information.

TABLE VIII - 30.--MINIMUM EX-VESSEL SHARING PRICES, WHITE AND GROOVED SHRIMP, FOR SIZE CLASSES AND GEOGRAPHIC AREAS INDICATED, 1950, 1951 AND 1952

Month	1950		1951				1952			
	Biloxi, Miss.		Bayou LaBatre, Ala.		Morgan City, La.		Bayou LaBatre, Ala.		Morgan City, La.	
	White	Grooved	White	Grooved	White	Grooved	White	Grooved	White	Grooved
	31-40 Count		28-40 Count		21-25 Count		26-40 Count		26-30 Count	
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
January	28	28	24	24	44	34	14	14	34	30
February	28	28	24	24	44	34	14	14	36	30
March	28	28	28	28	44	34	14	14	38	34
April	28	28	28	28	44	34	14	14	38	34
May	28	28	28	28	44	34	14	14	38	34
June	28	28	28	28	44	34	14	14	38	34
July	28	28	28	28	44	34	15	14	46	36
August	28	28	24	24	40	34	15	14	46	36
September	28	28	24	24	40	34	17	15	46	36
October	28	28	24	24	40	34	17	15	46	36
November	28	28	24	24	36	34	17	15	46	36
December	n.a.	n.a.	24	24	36	34	n.a.	17	46	39

Note: No data by different varieties available for later years.

n.a. - Data not available.

TABLE VIII - 31.--MINIMUM EX-VESSEL SHARING PRICES OF SHRIMP (HEADS-OFF) BY SIZE CLASSES (MONTHLY AVERAGES FOR ALL VARIETIES, ALL AREAS), 1948 - 1954

1948

Month	25 Count	26-35 Count	36 Count
	(Cents per pound)		
January	56	36	24
February	56	36	24
March	56	36	24
April	48	36	24
May	48	36	24
June	48	36	24
July	48	36	24
August	48	36	24
September	48	36	24
October	48	36	24
November	44	32	20
December	44	32	20

1949

Month	20 Count	21-25 Count	26-30 Count	31-42 Count	36 Count
	(Cents per pound)				
January	48	40	36	24	24
February	48	40	36	24	24
March	48	40	36	24	24
April	48	40	36	24	24
May	48	40	36	24	24
June	48	40	36	24	24
July	48	40	36	24	24
August	48	40	36	24	24
September	48	40	36	24	24
October	48	41	36	28	24
November	44	40	32	28	20
December	44	40	32	28	20

TABLE VIII - 31.--MINIMUM EX-VESSEL SHARING PRICES OF SHRIMP (HEADS-OFF) BY SIZE CLASSES (MONTHLY AVERAGES FOR ALL VARIETIES, ALL AREAS), 1948 - 1954 - Continued

1950

Month	20 Count	21-25 Count	26-30 Count	31-42 Count	36 Count
	(Cents per pound)				
January	44	39	35	30	22
February	44	39	35	30	22
March	44	39	35	30	22
April	54	39	35	30	22
May	54	40	36	31	24
June	64	40	36	31	24
July	64	40	36	31	24
August	53	40	38	32	24
September	44	39	36	31	24
October	44	39	36	31	24
November	44	39	36	31	24
December	42	37	36	31	24

1951

Month	20 Count	21-25 Count	26-30 Count	31-42 Count	36 Count
	(Cents per pound)				
January	40	38	33	24	19
February	40	38	34	24	19
March	41	38	33	26	19
April	41	39	32	26	19
May	41	39	34	26	19
June	42	39	34	26	16
July	42	38	31	25	20
August	44	37	29	25	16
September	45	36	33	26	13
October	45	36	32	26	13
November	44	35	28	27	12
December	42	36	29	24	14

TABLE VIII - 31.--MINIMUM EX-VESSEL SHARING PRICES OF SHRIMP (HEADS-OFF) BY SIZE CLASSES (MONTHLY AVERAGES FOR ALL VARIETIES, ALL AREAS), 1948 - 1954 - Continued

1952

Month	20 Count	21-25 Count	26-30 Count	31-42 Count	36 Count
	(Cents per pound)				
January	41	38	32	19	13
February	41	37	33	19	13
March	42	36	36	21	13
April	42	36	36	21	10
May	42	30	36	21	10
June	43	30	36	22	10
July	41	31	41	21	13
August	41	34	41	21	13
September	40	34	41	22	12
October	40	34	41	22	14
November	43	34	41	22	14
December	44	36	44	25	15

1953

Month	20 Count	21-25 Count	26-30 Count	31-42 Count	36 Count
	(Cents per pound)				
January	52	48	42	33	12
February	53	49	43	34	10
March	58	54	48	40	08
April	60	56	50	42	08
May	62	58	52	44	08
June	62	58	52	40	08
July	62	58	44	37	08
August	54	50	46	36	08
September	54	50	46	36	08
October	54	50	46	36	08
November	54	50	46	36	08
December	54	50	46	36	08

TABLE VIII - 31.--MINIMUM EX-VESSEL SHARING PRICES OF SHRIMP (HEADS-OFF) BY SIZE CLASSES (MONTHLY AVERAGES FOR ALL VARIETIES, ALL AREAS), 1948 - 1954 - Continued

1954

Month	20 Count	21-25 Count	26-30 Count	31-42 Count	36 Count
	(Cents per pound)				
January	54	50	46	36	-
February	54	50	44	35	-
March	54	50	44	35	-
April	48	44	38	30	08
May	48	44	38	30	08
June	48	44	38	30	08
July	40	36	30	27	-
August	40	36	30	27	-
September	40	36	30	27	-
October	40	36	30	27	-
November	40	36	30	27	-
December	40	36	30	27	-

TABLE VIII - 32.--MINIMUM EX-VESSEL SHARING PRICES OF SHRIMP (HEADS-OFF) 26-30 COUNT, (MONTHLY AVERAGES FOR ALL VARIETIES, ALL AREAS), 1949 - 1954

Month	1949	1950	1951	1952	1953	1954
	(Cents per pound)					
January	36	35	33	32	42	46
February	36	35	34	33	43	44
March	36	35	33	36	48	44
April	36	35	32	36	50	38
May	36	36	34	36	52	38
June	36	36	34	36	52	38
July	36	36	31	41	44	30
August	36	38	29	41	46	30
September	36	36	33	41	46	30
October	36	36	32	41	46	30
November	32	36	28	41	46	30
December	32	36	29	44	46	30

Wholesale Prices

Wholesale price information on shrimp products is available from two sources. The Market News Service, Bureau of Commercial Fisheries, United States Fish and Wildlife Service collects data f.o.b. shrimp landing ports as well as f.o.b. receiving centers. Considerable detail on prices is available for frozen shrimp received in Boston and Chicago and for fresh and frozen shrimp received in New York City.

The Bureau of Labor Statistics of the United States Department of Labor includes monthly average prices of fresh headless shrimp (26-30 count) in New York in the computation of its index of processed fresh fish and shellfish wholesale prices. Monthly average prices of packaged frozen headless shrimp (26-30 count) in five pound packages in Chicago are considered in the computation of its index of frozen processed fish and shellfish wholesale prices. The Bureau of Labor Statistics monthly average prices for shrimp products are obtained from the Market News Service, Bureau of Commercial Fisheries, United States Fish and Wildlife Service.

On the wholesale market, as on the fisherman's level, fresh and frozen shrimp are sold by count, with the larger sizes bringing higher prices. There is also a price differential between the different varieties of shrimp, with white shrimp generally bringing higher prices than brown or pink shrimp of comparable qualities.

Wholesale market counts generally used are in multiples of 5.

In actual practice, the number of shrimp in a shipment designated 21 to 25 or 26 to 30 do not all fall within the given range, but will average close to it. Shipments in these categories are useful to processors who do not require specific grading. Institutional buyers, such as large hotels, restaurants and drive-in restaurants, demand shrimp counts in a close range. Some of these institutions will purchase only 26-30 count shrimp, knowing that 5 to 6 shrimp will be equivalent to one serving, thus eliminating additional measurement.

Production Center-Wholesale Price Data

Table VIII - 33 depicts the range of wholesale prices f.o.b. Texas ports in 1951-1956.

TABLE VIII - 33.--RANGE OF WHOLESALE PRICES OF FROZEN GROOVED SHRIMP F.O.B. LOCALITIES IN TEXAS (15-20 count, heads off)

Year	Cents per pound	Year	Cents per pound
1951	47 - 67	1954	49 - 78
1952	52 - 78	1955	52 - 75
1953	66 - 110	1956	59 - 82

Consumption Center-Wholesale Price Data

Comparison with production center statistics.--For comparison with the Texas data, the annual range of wholesale prices of frozen

grooved shrimp (15-20 count) f.o.b. Chicago can be used. The range of prices in the Chicago market was as follows:

TABLE VIII - 34.--ANNUAL RANGE OF WHOLESALE PRICES OF FROZEN GROOVED SHRIMP IN THE CHICAGO, ILLINOIS MARKET, 1951 - 1958
(15-20 count, heads off)

Year	Cents per pound	Year	Cents per pound
1951	56 - 72	1955	57 - 87
1952	58 - 82	1956	81 - 93
1953	76 - 115	1957	87 - 110
1954	56 - 82	1958 (Prel.)	90 - 108

While the average differential between Texas and Chicago prices seem to approximate 6-7 cents, the data indicate that there is an apparent difficulty on the part of the Chicago dealers to pass the increased costs on to the buyers, the difference between the annual highs in the two series being much less pronounced than the difference between the two lows.

Variations between individual consumption centers.--Chicago, New York, and Boston wholesale prices of shrimp (quarterly averages for all varieties, 26-30 count) are compared in figure VIII - 23. The figure indicates that, over most of the period under observation, Chicago prices were slightly lower than prices in the other two markets. Boston prices nearly always were highest because of the city's greater distance from the fishing centers. When fishing activities are at a seasonal low, prices in the market which depends on fresh shrimp tend to be higher, as is shown by the first quarter average prices in New York in 1951 and 1952. The figure also shows that the difference between the lowest and highest average prices in the three markets rarely exceeds six cents, the differential usually being largest in the fourth quarter.

A comparison of the range between the weekly highs and lows in wholesale prices for fresh and frozen shrimp is shown in figure VIII - 24. The figure points up the considerably greater amplitude of price fluctuations in the New York fresh shrimp, than in the Chicago frozen shrimp market.

Comparison between wholesale prices of fresh and frozen shrimp in one market - New York.--Average monthly wholesale prices for 26-30 count shrimp in fresh and frozen form from 1953 through 1958 in the New York market are compared in figure VIII - 25. Characteristically, during the period of peak production in the second half of the year fresh shrimp prices are below frozen shrimp prices because fresh shrimp have to be disposed of without delay and cannot be distributed over a wide market. During the fall of 1954 the difference between fresh and frozen prices was less pronounced than in the other years since the large cold storage holdings constituted a depressing influence in the frozen shrimp market. The same situation may be noted in 1958.

FIGURE VIII - 23.--QUARTERLY AVERAGE WHOLESALE PRICES OF SHRIMP
IN NEW YORK, NEW YORK; BOSTON, MASSACHUSETTS AND CHICAGO, ILLINOIS, 1951-1958
(26-30 count)

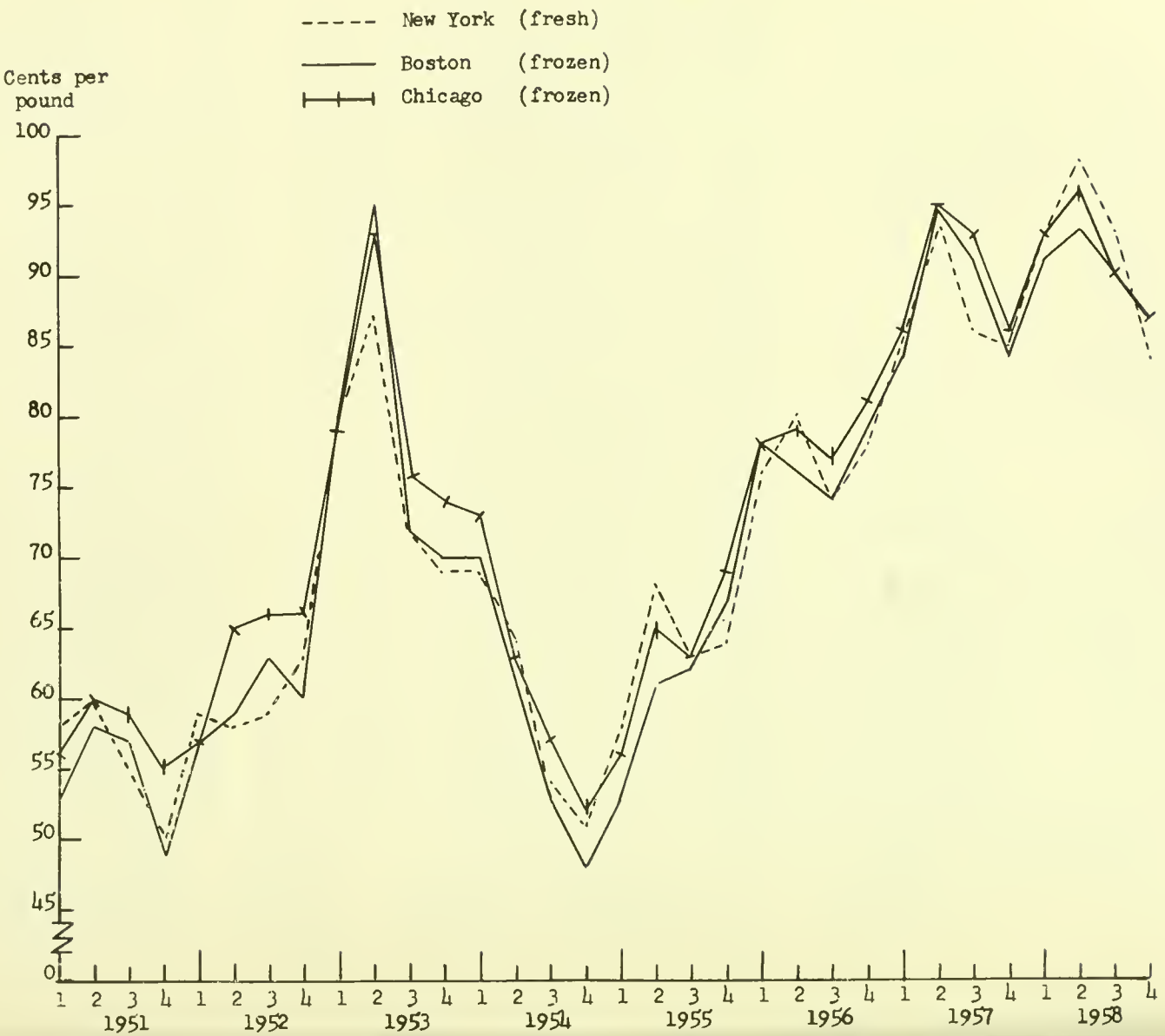


FIGURE VIII - 24.--WEEKLY RANGE OF WHOLESALE PRICES FOR SHRIMP, 1954

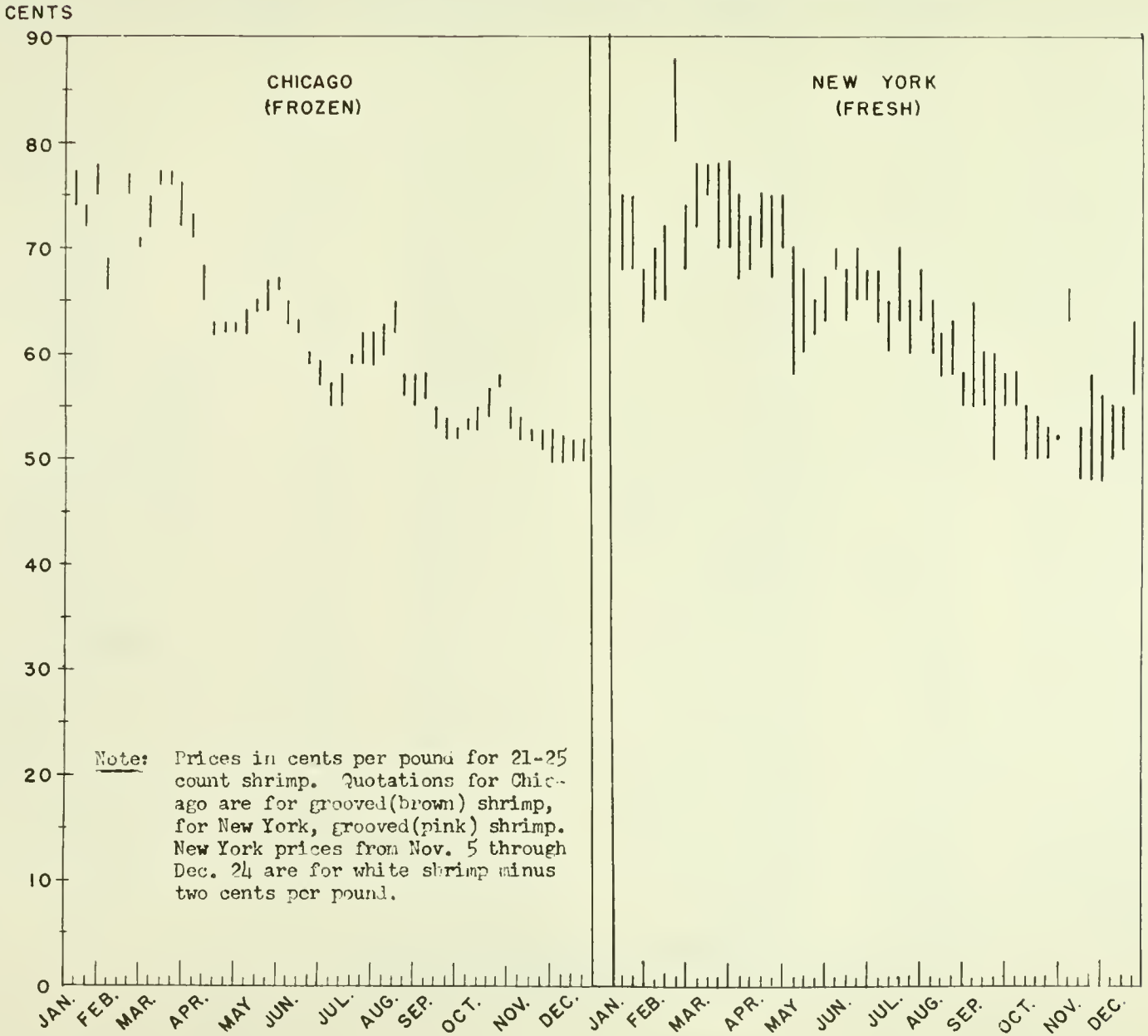


FIGURE VIII - 25.--MONTHLY AVERAGES OF WHOLESALE PRICES OF FRESH AND FROZEN SHRIMP IN NEW YORK, NEW YORK, JANUARY 1953 TO DECEMBER 1958
(26-30 count, heads off)

Variations between species and size classes.--As shown in table VIII - 35, a price differential between white and grooved shrimp persists in the wholesale market. This table compares the monthly wholesale prices of frozen shrimp (white and grooved) at Chicago for the years 1955 and 1958. Generally speaking, white shrimp commanded a premium over grooved shrimp of similar count. This premium ranged from only one cent per pound to nine cents for the less than 15 count. In the 15-20's, the white shrimp brought a price differential of three to five cents a pound most of the time, although it did go as high as 10 cents during October 1958. An even greater differential is observed in the 21-25 count shrimp.

Wholesale prices in the New York fresh shrimp market are incomplete, owing to the relatively small amount of shrimp sold on this market. The available data, however, indicate a considerable price differential between size classes for the different species as well as for the same variety of shrimp.

Average wholesale prices (26-30 count for all varieties and consumption centers considered).--For the purpose of comparing ex-vessel, wholesale and retail prices an average of wholesale prices for the 26-30 count of all varieties and consumption centers was computed. The series, beginning with January 1950, is shown in table VIII - 36.

Retail Prices

Retail prices of shrimp have been compiled for two markets, New York and Boston (see tables VIII - 37 and VIII - 38). The data collected are the most general prices listed on the weekly retail price reports of the Bureau of Consumers' Service and Research, Department of Markets, City of New York, and on the Boston retail price reports published by the Division of Markets of the Massachusetts Department of Agriculture.

An average retail price has been computed for purposes of comparing the retail price series with ex-vessel and wholesale figures (see table VIII - 39).

Price Spreads

The approximate spread between prices paid to the fisherman, prices received by the dealer, and prices received by the retailer can be studied on the basis of the average prices computed in tables VIII - 31, VIII - 36 and VIII - 39. A graph of the three series is shown in figure VIII - 26.

TABLE VIII - 35.--MONTHLY WHOLESALE PRICES OF FROZEN SHRIMP, AT CHICAGO, BY VARIETIES AND SIZE CLASSES 1955 AND 1958

(Cents per pound)

Year and month	White					Grooved				
	Less than 15 count	15-20 count	21-25 count	26-30 count	31-35 count	Less than 15 count	15-20 count	21-25 count	26-30 count	31-35 count
1955:										
January	-	67	63	58	-	69	62	57	52	-
February	80	70	65	-	-	71	65	61	55	-
March	80	70	65	-	-	71	65	61	55	-
April	-	70	65	-	-	70	65	59	55	-
May	-	70	65	-	-	79	65	60	55	-
June	79	77	72	-	-	78	74	69	64	-
July	83	81	76	-	-	80	78	75	70	-
August	82	80	75	-	-	79	76	67	63	-
September	-	77	71	-	-	75	71	61	56	-
October	-	77	71	-	-	75	68	58	54	48
November	-	80	75	70	-	80	75	70	65	60
December	89	84	79	-	-	90	86	81	76	71
1958:										
January	-	104	99	94	-	104	101	96	91	86
February	105	97	87	83	-	100	90	84	77	-
March	-	106	102	96	-	106	103	97	93	88
April	-	101	96	91	-	100	98	94	88	84
May	-	97	92	88	-	95	94	90	84	80
June	-	110	105	100	-	112	107	102	97	92
July	-	107	102	97	-	-	107	102	97	-
August	-	104	99	93	-	102	102	94	84	78
September	-	103	98	93	-	100	100	92	82	75
October	99	102	92	93	-	91	92	87	78	-
November	-	95	90	85	-	94	92	88	82	78
December	-	102	98	92	-	103	99	93	89	74

TABLE VIII - 36.--MONTHLY AVERAGE WHOLESALE PRICES OF SHRIMP (26-30 COUNT, ALL VARIETIES, NEW YORK, BOSTON, CHICAGO) 1950-1958

(Cents per pound)

Month	1950	1951	1952	1953	1954	1955	1956	1957	1958
January	60	54	54	79	74	54	78	84	88
February	63	55	59	80	69	58	79	85	95
March	63	58	62	83	72	59	77	88	96
April	66	57	62	90	66	61	78	93	92
May	66	58	57	105	63	63	79	95	93
June	65	63	63	84	60	68	77	95	100
July	65	63	64	81	57	67	84	96	97
August	64	56	65	71	55	59	78	95	91
September	59	54	64	70	52	57	70	83	87
October	56	51	60	69	50	57	76	84	85
November	59	50	63	69	50	69	84	86	85
December	55	52	68	72	51	76	83	86	84

TABLE VIII - 37.--RETAIL PRICES OF SHRIMP - FRESH, 1950-1958

(Most representative price for New York)

(Cents per pound)

Month	1950	1951	1952	1953	1954	1955	1956	1957	1958
January	-	75	85	100	98	85	108	110	-
February	-	80	85	101	95	89	110	110	-
March	-	85	88	110	95	91	110	110	-
April	-	85	85	110	100	94	110	-	-
May	-	85	85	123	98	90	100	-	-
June	-	89	88	101	85	90	108	-	-
July	80	90	88	104	87	90	110	-	-
August	83	86	85	98	90	90	110	-	-
September	83	85	88	93	90	86	107	-	-
October	78	82	88	98	86	85	100	-	-
November	76	75	88	96	85	89	106	-	107
December	75	75	90	100	80	100	110	-	112

TABLE VIII - 38.--RETAIL PRICES OF SHRIMP - FRESH, 1950-1958
(Most representative price for Boston)

(Cents per pound)

Month	1950	1951	1952	1953	1954	1955	1956	1957	1958
January	79	79	86	94	106	87	102	100	135
February	79	79	84	95	118	86	99	100	120
March	82	77	83	95	115	85	99	100	112
April	82	77	85	95	104	82	99	104	113
May	82	1/78	86	118	103	85	99	114	(2)
June	82	81	85	128	99	88	99	112	115
July	(2)	80	85	124	91	92	99	120	112
August	-	80	88	113	86	92	100	125	112
September	-	81	87	107	88	91	98	125	112
October	74	89	88	112	84	87	99	125	110
November	74	87	90	107	90	92	100	125	112
December	79	85	88	104	89	99	100	135	(2)

1/ Estimated.
2/ No shrimp shown on report.

TABLE VIII - 39.--RETAIL PRICES OF SHRIMP - FRESH, 1950-1958
(Most representative prices for New York and Boston averaged)

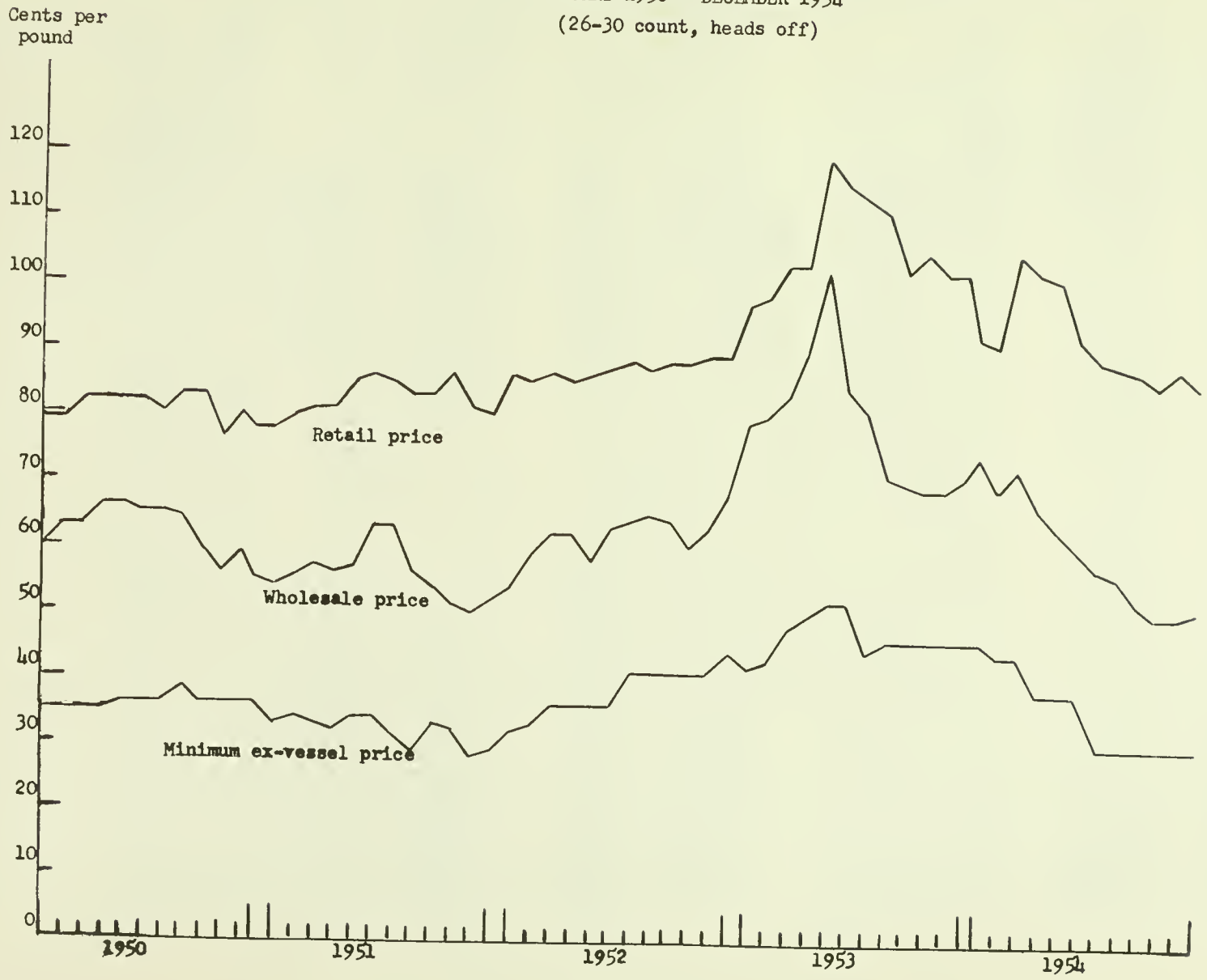
(Cents per pound)

Month	1950	1951	1952	1953	1954	1955	1956	1957 1/	1958 2/
January	79	77	86	97	102	86	105	105	135
February	79	80	85	98	106	88	104	105	120
March	82	81	85	103	105	88	104	105	112
April	82	81	85	103	102	89	104	104	113
May	82	81	86	120	101	88	100	114	(3)
June	82	85	87	115	92	89	104	112	115
July	80	85	86	114	89	91	104	120	112
August	83	83	87	105	88	91	105	125	112
September	83	83	88	100	89	88	102	125	112
October	76	86	88	105	85	86	100	125	110
November	75	81	89	102	88	89	103	125	110
December	77	80	89	102	85	100	105	135	112

1/ Data represent Boston only for January through October.
2/ Data represent Boston only for April through December.
3/ No shrimp shown on reports.

FIGURE VIII - 26.--MINIMUM EX-VESSEL, WHOLESALE, AND RETAIL PRICES OF SHRIMP, JANUARY 1950 - DECEMBER 1954

(26-30 count, heads off)



As can be expected of the several price series forming part of the same price structure, there is a high degree of relationship between the data. An inspection of the graph appears to indicate that changes in retail prices in several instances have lagged somewhat behind changes in the wholesale series.

This comparison is not based on identical sizes and grades of shrimp, since the retail prices are based on a variety of sizes and species. However, the comparison does give a general indication of trends and of the close relation in price movements in the different levels of distribution.

Figure VIII - 27 shows that wholesale prices in any one year averaged from 65 to 76 percent of retail prices over the period from 1950 to 1954. Ex-vessel sharing prices expressed in terms of retail prices during the same period ranged from 39 to 45 percent. Again, this is a rough comparison based only on Boston and New York City retail prices. It gives some general idea as to sharing of the consumer's dollar for shrimp sold in northeastern United States cities.

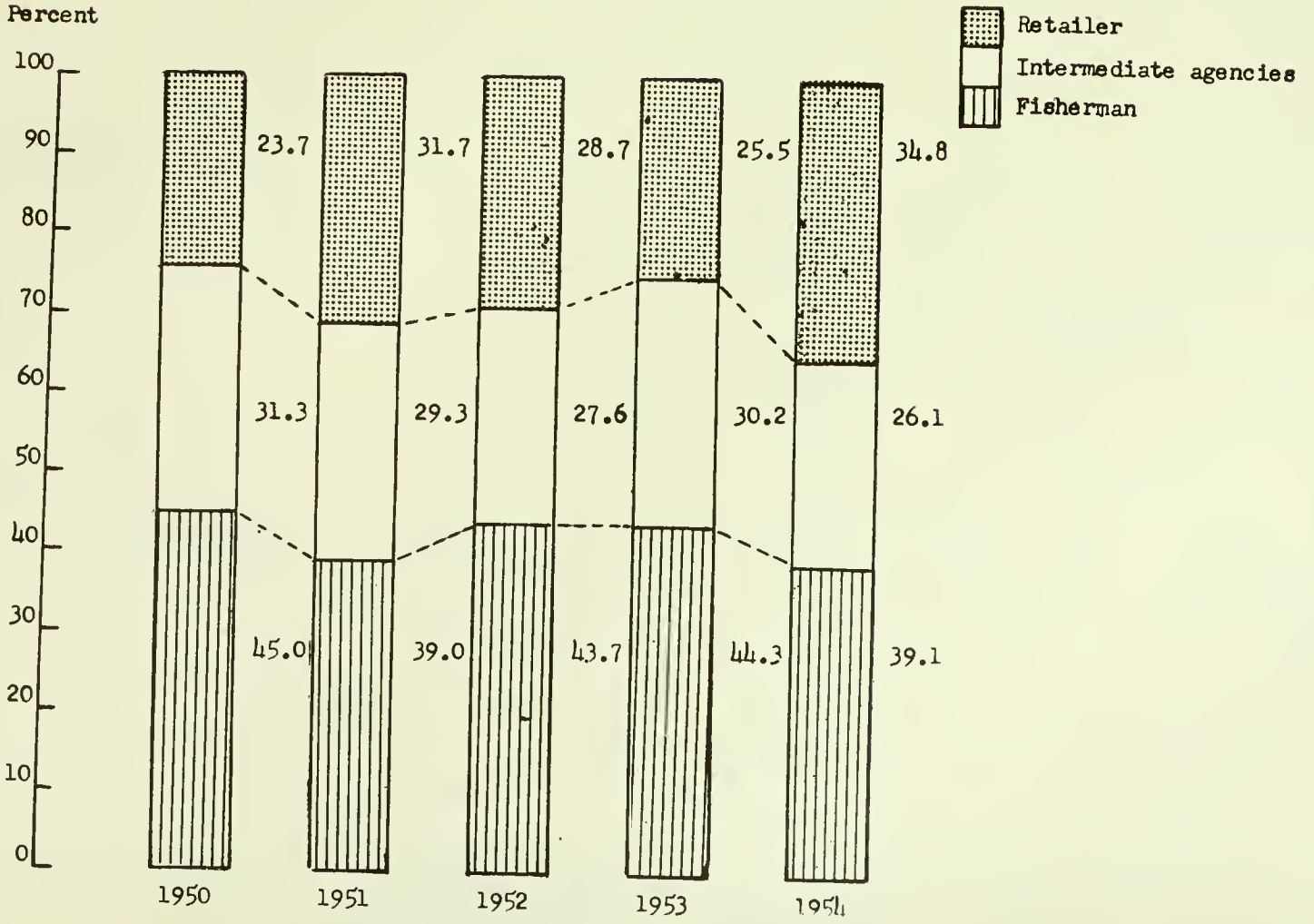
Comparisons of Wholesale Price Indexes

The wholesale price indexes of fresh and frozen shrimp computed by the Bureau of Labor Statistics have been compared with wholesale price indexes of other foods. Figure VIII - 28 compares frozen shrimp with all foods. The ups and downs in the shrimp index are in sharp contrast to the virtually straight, slightly slanting line representing the index of all foods. The absence of violent fluctuations in the latter series is explained by the fact that individual components of the series changing in opposite directions cancel each other out.

The comparison of the frozen shrimp wholesale index with the frozen fish wholesale index reveals a close relationship between the two series (see figure VIII - 29). The same can be said of a comparison between the wholesale price index of fresh shrimp and the wholesale index of fresh processed fish (see figure VIII - 30). The graphs of the two series for all frozen and for all fresh fish, because of offsetting price variations for individual species, are characterized by greater smoothness than the corresponding series for shrimp.

Two additional figures comparing wholesale price indexes for frozen shrimp with meat and processed poultry, respectively, are shown below. The relationship between shrimp and poultry prices is not clearly established, the data sometimes moving in the opposite, then again in the identical direction. Between shrimp and meat prices an inverse relationship appears to have existed over the period for which data have been plotted (see figures VIII - 31 and VIII - 32).

FIGURE VIII - 27.--SHARE OF CONSUMER'S DOLLAR FOR FRESH SHRIMP OBTAINED BY RETAILER, INTERMEDIATE AGENCIES AND FISHERMAN, 1950 - 1954 1/



1/ Based on Boston and New York City retail sales.

FIGURE VII - 28.--MONTHLY WHOLESALE PRICE INDEXES:
ALL FOODS AND FROZEN SHRIMP, 1953-1958
(1947-1949 base = 100)

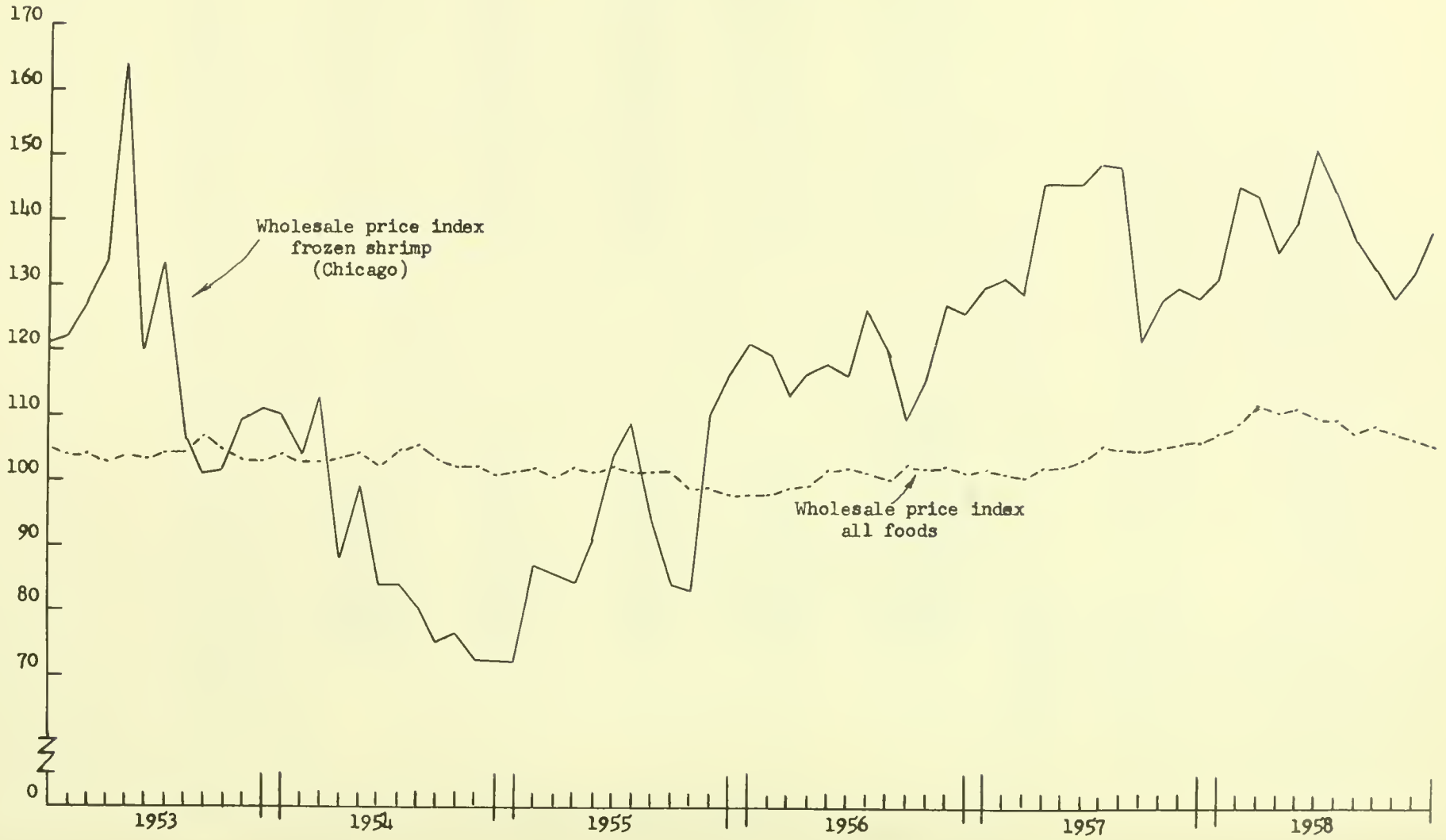


FIGURE VIII - 29.--MONTHLY WHOLESALE PRICE INDEXES:
FROZEN FISH AND FROZEN SHRIMP, 1953-1958
(1947-1949 base = 100)

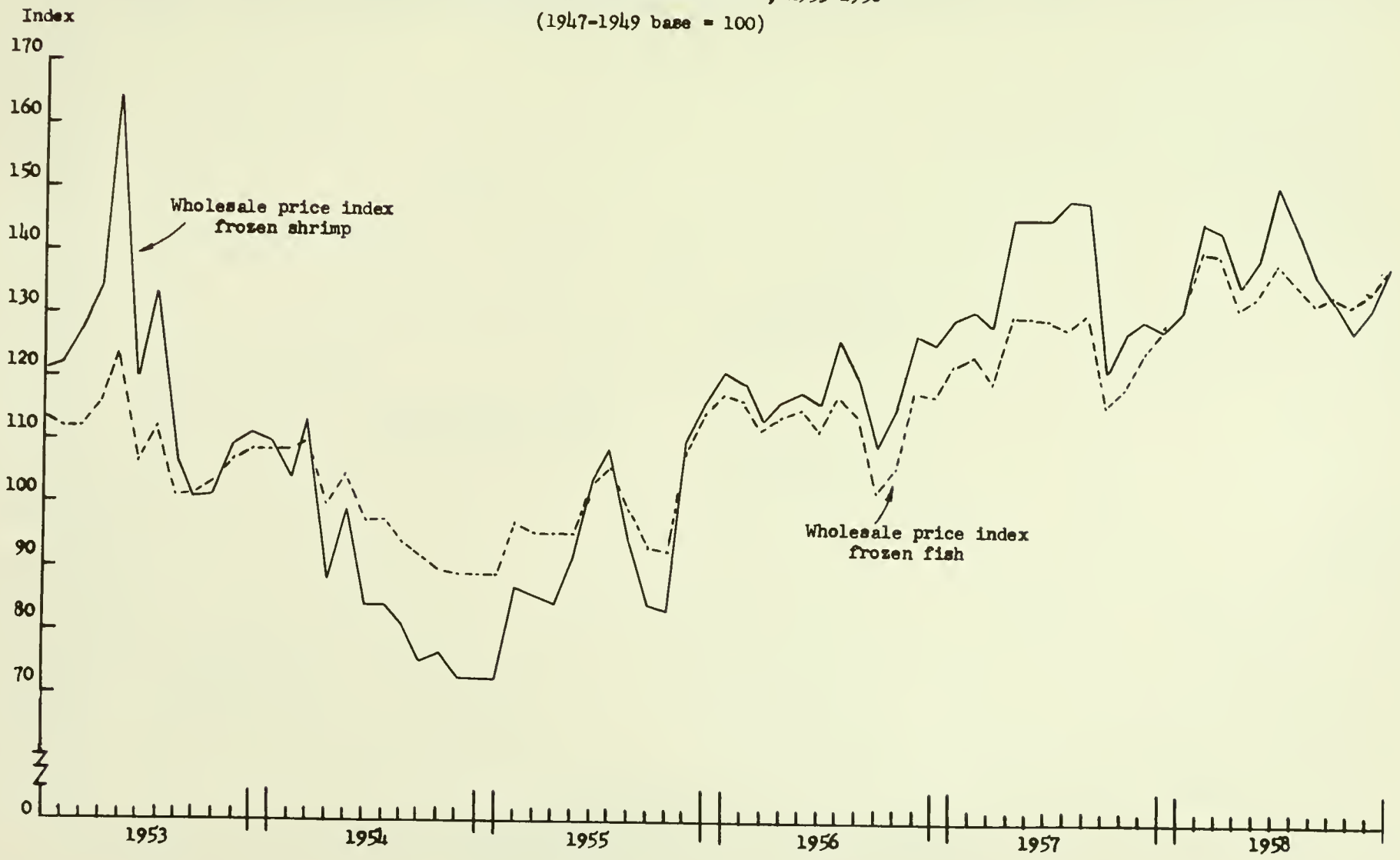


FIGURE VIII - 30.--MONTHLY WHOLESALE PRICE INDEXES: FRESH PROCESSED FISH AND FRESH SHRIMP, 1953-1958
(1947-1949 base = 100)

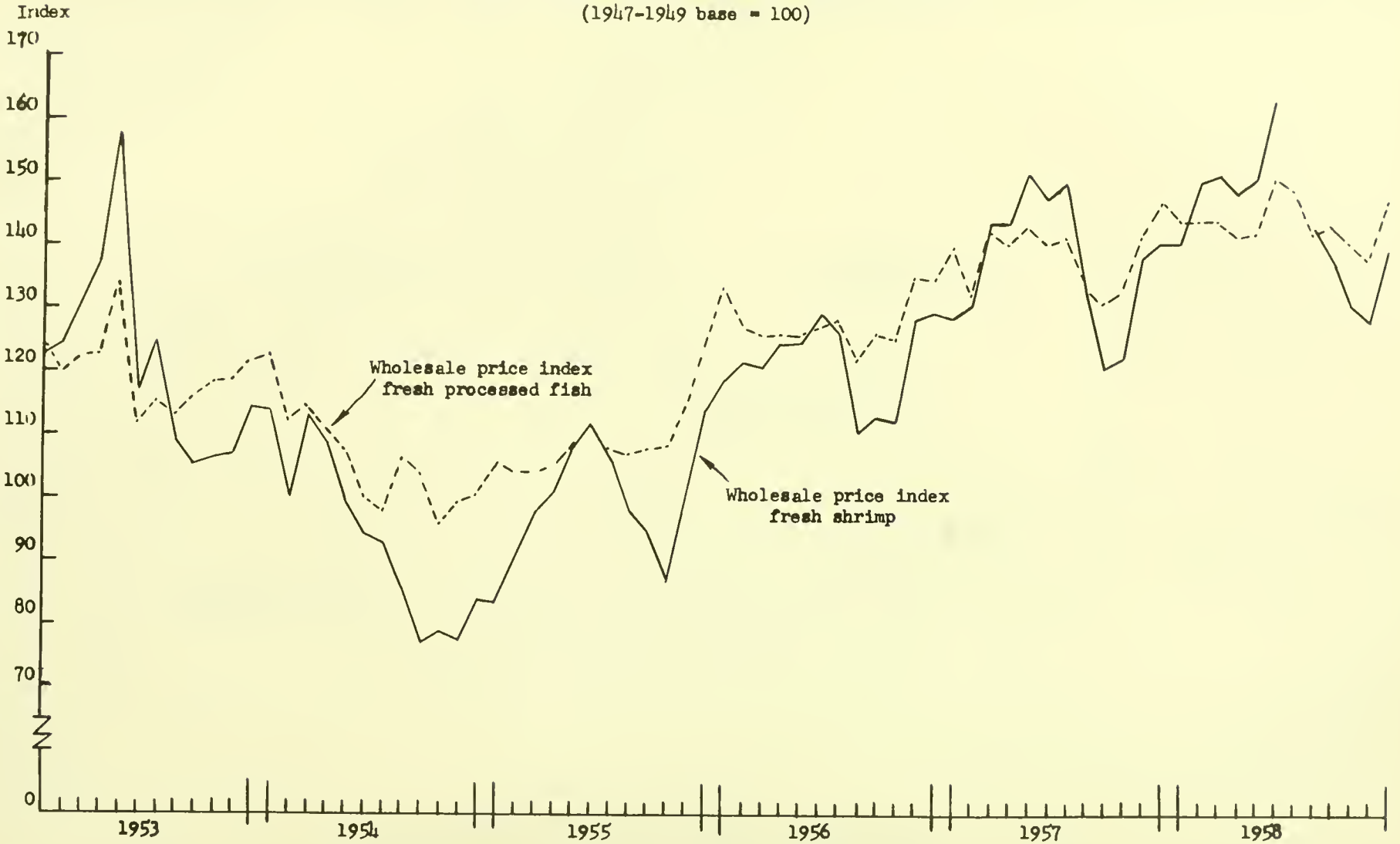


FIGURE VIII - 31.--MONTHLY WHOLESALE PRICE INDEXES:
MEAT AND FROZEN SHRIMP, 1953-1958
(1947-1949 base = 100)

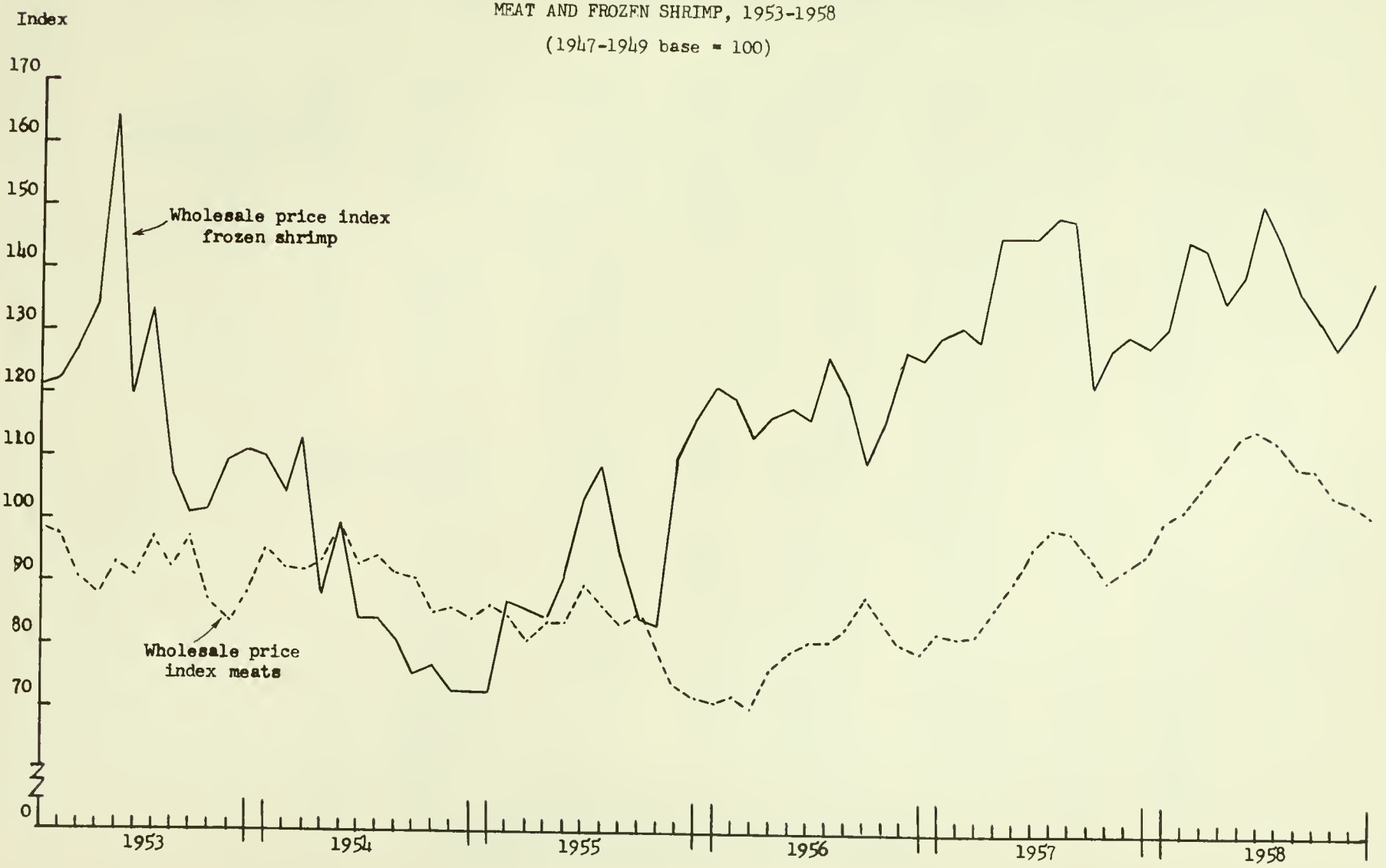
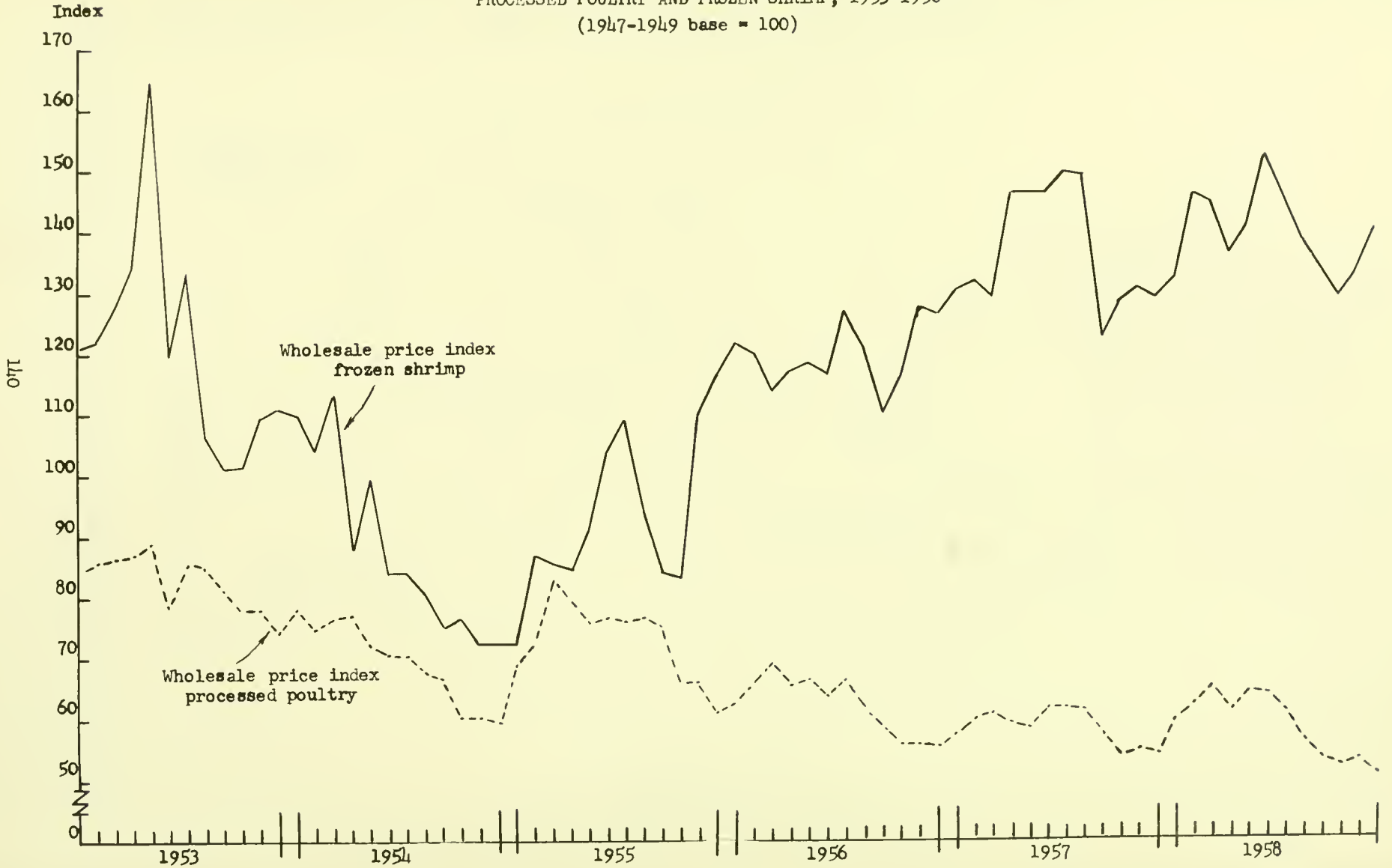


FIGURE VIII - 32.--MONTHLY WHOLESALE PRICE INDEXES:
PROCESSED POULTRY AND FROZEN SHRIMP, 1953-1958
(1947-1949 base = 100)



SELECTED REFERENCES

Daniel, E. P. and McCollum, E. V.
1931 Studies in the nutritive value of fish meals. United States Bureau of Fisheries, Institutional Report 2, Washington, D. C.

Kahn, Richard A.
1948 Some aspects of future consumption of fresh and frozen fishery products. Fishing Gazette, Annual Review.

Kahn, R. A. and Stolting, W. H.
1949 Sales patterns for fresh and frozen fish and shellfish, 1936 and 1946. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Fishery Leaflet 365)

Lee, Charles F.
1954 Composition of cooked fish dishes. United States Department of the Interior, Fish and Wildlife Service, Washington, D. C. (Circular 29)

McCance, R. A. and Widdowson, E. M.
1947 The chemical composition of foods. Chemical Publishing Company, Inc., Brooklyn, N. Y., 2nd Revised Edition.

Pugsley, L. I.
1942 The nutritive value of marine products XV - proximate analyses of canned British Columbia crabs, shrimps, and clams. Journal of the Fisheries Research Board of Canada, vol. V, no. 4, pp. 344-346. January.

Stolting, W. H.
1952 Some economic aspects of the southern shrimp fishery. Proceedings of the Gulf and Caribbean Fisheries Institute, Fourth Annual session, Marine Laboratory, University of Miami, Coral Gables, Florida.

Taylor, Harden K.
1951 Survey of marine fisheries of North Carolina. The University of North Carolina Press.

Tressler, D. K. and Lemon, J. McW.
1951 Marine products of commerce. Reinhold Publishing Corporation, New York, N. Y.

CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

A study of the 1953-1954 shrimp market situation reveals the dangers the industry is exposed to during periods of unusual supply shortages or gluts. Exceptional profit-making opportunities may lead to overcrowding in the fishery; the reduced catch per operating unit may necessitate intensified fishing efforts; the resulting overfishing in turn may imperil supply. Supply deficits may cause price inflation, which, especially if coincident with a general recession in the economy, may adversely affect demand, bring about stagnation in the wholesale market and threaten the fisherman with ruin. The disaster resulting from this vicious circle is magnified if, just as sales decline, supply suddenly becomes more plentiful and the augmented stocks have to be disposed of at less than break-even prices. Particularly vulnerable at such times are those fishermen who are burdened with high fixed costs, such as those who had to invest in bigger and sturdier boats to exploit the new off-shore fishery.

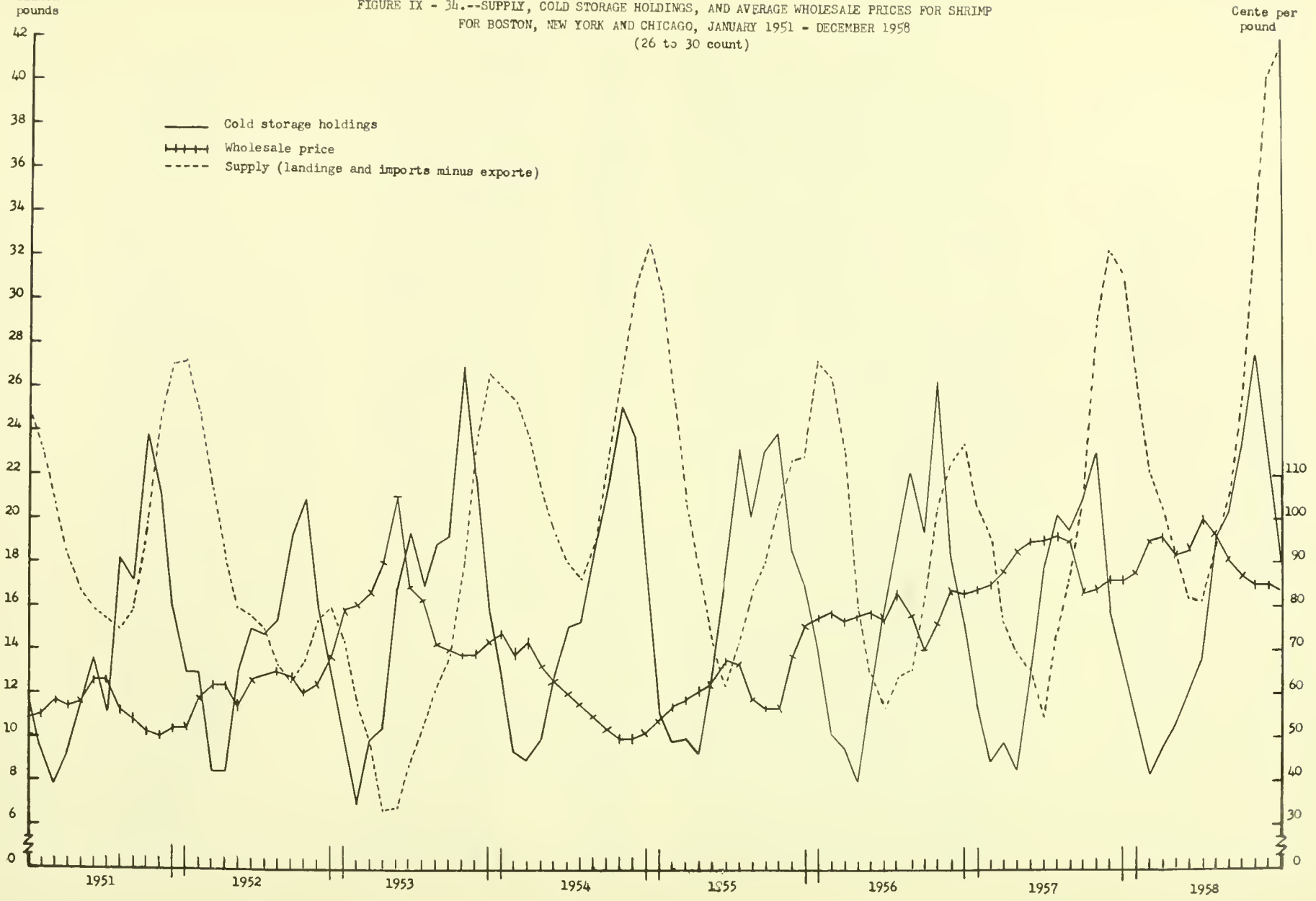
The shrimp industry's welfare can be safeguarded best (1) by increasing the efficiency of operations at all levels, and thus effecting cost savings in shrimp production, processing, and distribution, and (2) by stabilizing markets.

Production problems in the fishery and their possible solutions have been discussed in Chapters II, III, and IV. The processors problems and their possible solutions are covered in Chapter V. Chapters VI and VII dealt with the problems of the distributor and the mechanics of marketing. These two chapters together with the study of consumption and price analysis in Chapter VIII and the case study in this chapter, outline possible solutions for the problems engendered by market instability.

WHAT ACCOUNTS FOR THE UPS AND DOWNS IN THE SHRIMP MARKET--A BRIEF CASE STUDY

Figure IX - 33 shows the month by month changes in supply, cold storage holdings, and wholesale prices of shrimp from January 1951 to December 1958. An inspection of the chart indicates that early in 1953 seasonally short supplies followed by a substantial drop in cold storage holdings produced a sharp rise in wholesale prices.

FIGURE IX - 34.--SUPPLY, COLD STORAGE HOLDINGS, AND AVERAGE WHOLESALE PRICES FOR SHRIMP FOR BOSTON, NEW YORK AND CHICAGO, JANUARY 1951 - DECEMBER 1958
(26 to 30 count)



Consumer resistance to high prices ensued. This factor, plus an easing of the tight supply situation as the result of the seasonal pickup in production, led to a price break in May. Prices thereafter failed to recover to their normal extent when supply took its customary dip during the following winter months. They started to drop again, even before supply had fallen to its seasonal low (the point when prices usually reach a peak) in March of 1954. At the same time cold storage holdings did not decline to the extent they had in other years indicating a failure of demand to attain its previous level. As a result, when supplies began to build up later in 1954, frozen holdings reached an unprecedented high. The inventory accumulation was encouraged by a tendency on the part of the dealers to withhold supplies in the hope of a favorable turn in the market. Prices continued to drop for the remainder of the year. Early in 1955 price recovery set in when cold storage holdings were drastically reduced.

The effect on the fisherman may be shown by tracing the developments in the fishery starting with the extension of operations to the Dry Tortugas and the Gulf of Campeche.

The opening of new fishing grounds in 1950, and the subsequent market expansion, stimulated the boat building program in the following years. Table IX - 40 shows the registrations of new fishing vessels of five net tons and over in the South Atlantic and Gulf States during 1951-1955.

TABLE IX - 40.--NEW VESSEL REGISTRATIONS IN THE SOUTH ATLANTIC AND GULF STATES, 1951-1958

Year	Number of vessels	Year	Number of vessels
1951	291	1955	168
1952	250	1956	219
1953	380	1957	234
1954	432	1958	405

The number of registrations being 50 percent higher in 1953 than in the preceding year shows that boat building was further encouraged by the rise in shrimp prices prior to June 1953.

The peak in registrations, however, was not reached until 1954, or well after the shrimp market had started to decline. Vessels had already been ordered in the shipyards before the drop in the market destroyed the optimism engendered by the upward spiral in prices.

While vessels joined the fleet at the rate of more than one a day, producers' prices took a sharp dip. The break in ex-vessel

prices, as shown by figure VIII - 26, followed the decline in the wholesale market in May of 1953. The fact that the peak expansion of the fleet coincided with the period of declining prices did not make matters any easier for the fisherman.

As long as demand remains brisk, the fisherman can intensify his effort, distribute his fixed costs over a larger catch (provided resource limitations do not prevent increasing production) and thereby increase his profit, without weakening the market. New operating units at such times will be able to share in the general prosperity prevailing in the industry. If supply is relatively inflexible, the stepped-up fishing activities will manifest themselves primarily in a decline in tons of shrimp caught per ton of fishing capacity engaged in the fishery and in an increase in the ex-vessel price. If supply increases, the change in productivity per ton will depend on the respective rates of increase in supply and in fishing activity. Similarly, what happens to price will be determined by the rates of growth of supply and demand.

Trends in the shrimp industry which are typified by the above-described conditions can be summarized on the basis of statistical information presented in preceding chapters of this report.

The increase in demand for shrimp is best shown by a comparison of per capita consumption between prewar and postwar years. As illustrated in table VIII - 26, in 1930 the average American consumed approximately one-half of a pound of shrimp in edible weight, the equivalent of about one pound of raw heads-on shrimp. So far, in the 1950's per capita consumption has been twice as high.

Figure III - 38 shows that for every ton of fishing capacity in the shrimp fishery an average of 6-1/2 tons of shrimp were taken in 1930 as well as in 1940, as against approximately two tons in 1950, 1953, and 1954. This decrease in productivity per ton of fishing capacity took place during a period when supply was being substantially expanded as the result of the exploitation of the new fishing grounds off the Dry Tortugas and in the Gulf of Campeche. The rate of expansion of the fleet, however, far outstripped the rate at which supplies were added from the new grounds.

Everything else remaining equal, the lowering of the productivity per ton of vessel fishing capacity affects the fisherman adversely. With fixed costs distributed over a smaller output, net return is inevitably diminished. Fortunately for the fisherman, the increase in demand for shrimp permitted a steep rise in price since supply was unable to keep pace. Figure VIII - 22 shows that the average value of a pound of shrimp to the fisherman in recent years has been from seven to nine times the 1930 value. In contrast, as indicated by the United States Bureau of Labor Statistics price index series, the general level of prices only doubled during the same period.

As the productivity of his boat investment decreases, the fisherman is tempted to intensify his fishing effort. Coupled with the accelerated rate of additions to the fleet this tendency may create serious difficulties for him.

Given a limited supply, an increase in fishing intensity and size of fleet may lead to a lessening of production per unit of effort, or "overfishing", at least locally. The fisherman who finds it necessary to share with a larger number of colleagues the limited supply on the grounds he customarily fishes, is sorely tempted to increase his catch by transgressing conservation laws and regulations. This is especially true in the inshore fishery where it is usually impossible for the fisherman to follow supply and switch his operations to other geographic areas.

The economic consequences of an unchecked rise in price are much more quickly felt by the industry. Consumers will stop buying when prices have exceeded the point they think a commodity should sell for. If the onset of consumer resistance happens to coincide in time with a period of general decline in economic activity, the threat to the fisherman's economic position will be accentuated. It can be demonstrated that the summer of 1953, when shrimp prices started to break, was such a time. Figure IX - 34 contains graphs of shrimp wholesale prices and selected business indicator series which show traces of the 1953-1954 recession.

Any influence of cyclical factors on shrimp prices, insofar as such factors may have influenced the market situation in 1953-1954, is obscured by the fact that, while wholesale prices of certain foodstuffs did take a dip simultaneously with shrimp prices, both the wholesale price index for all commodities as well as for all processed foods maintained their level during the period of decline. There is reason to believe that the demand for shrimp, as long as it is still considered a relative luxury item, would be more severely affected by a dip in per capita disposable income than the demand for items generally regarded as staples.

The determination of the degree, if any, to which the demand for shrimp is influenced by cyclical fluctuations will have to await the gathering of additional evidence in future years. Because of the conflicting nature of the series depicted in figures IX - 34 and IX - 35 as well as other series not shown it is impossible to decide whether the parallel decline in shrimp prices and certain business indicators is another example of a spurious relationship rather than proof of a genuine relationship between the movements observed.

While causal factors are harder to determine, effects are much more easily described. Briefly, the precipitous drop in prices put the emphasis on costs in the fisherman's operations.

FIGURE IX - 34.--SELECTED BUSINESS TREND INDICATORS
AND WHOLESALE PRICES OF SHRIMP, 1952 - 1954

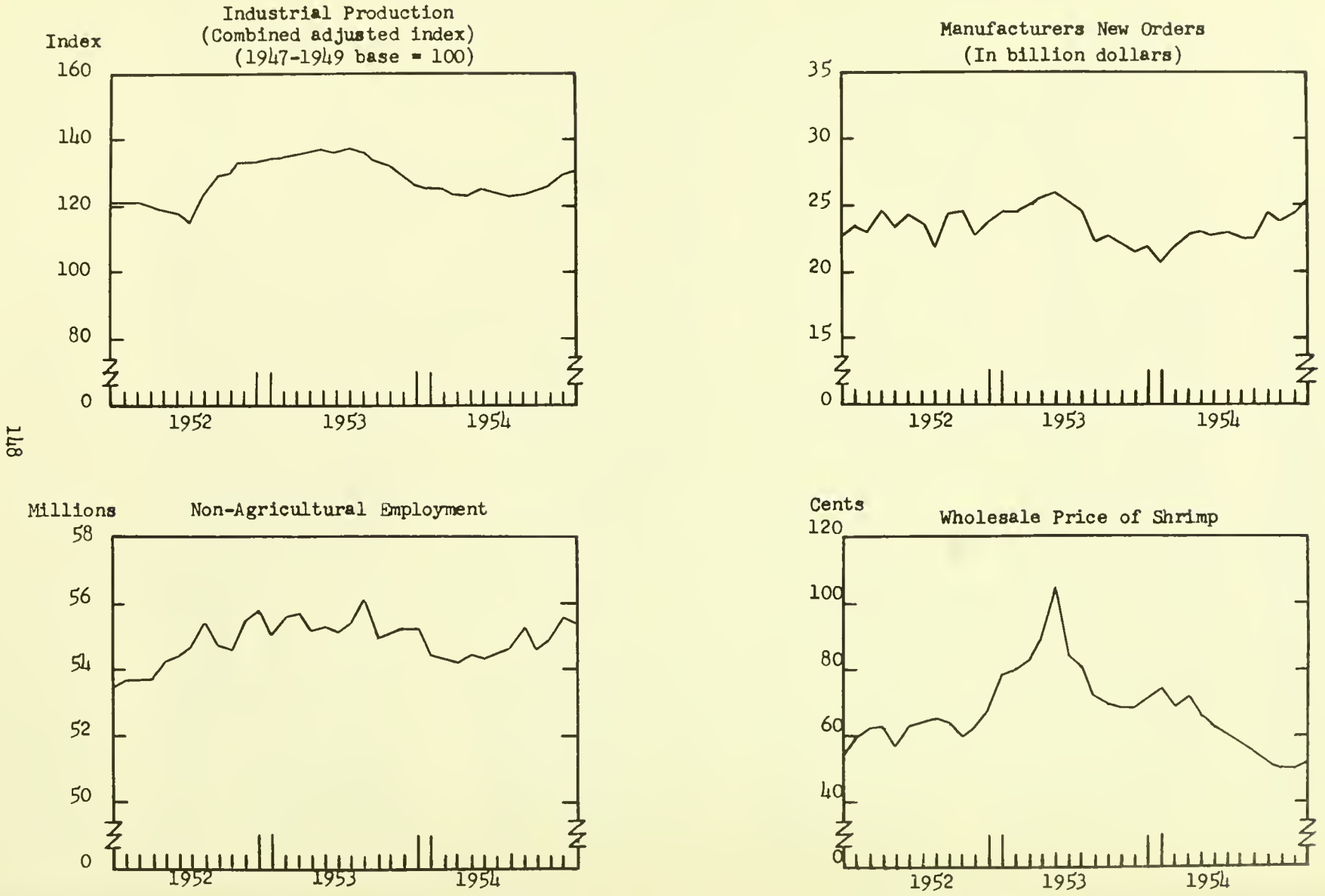
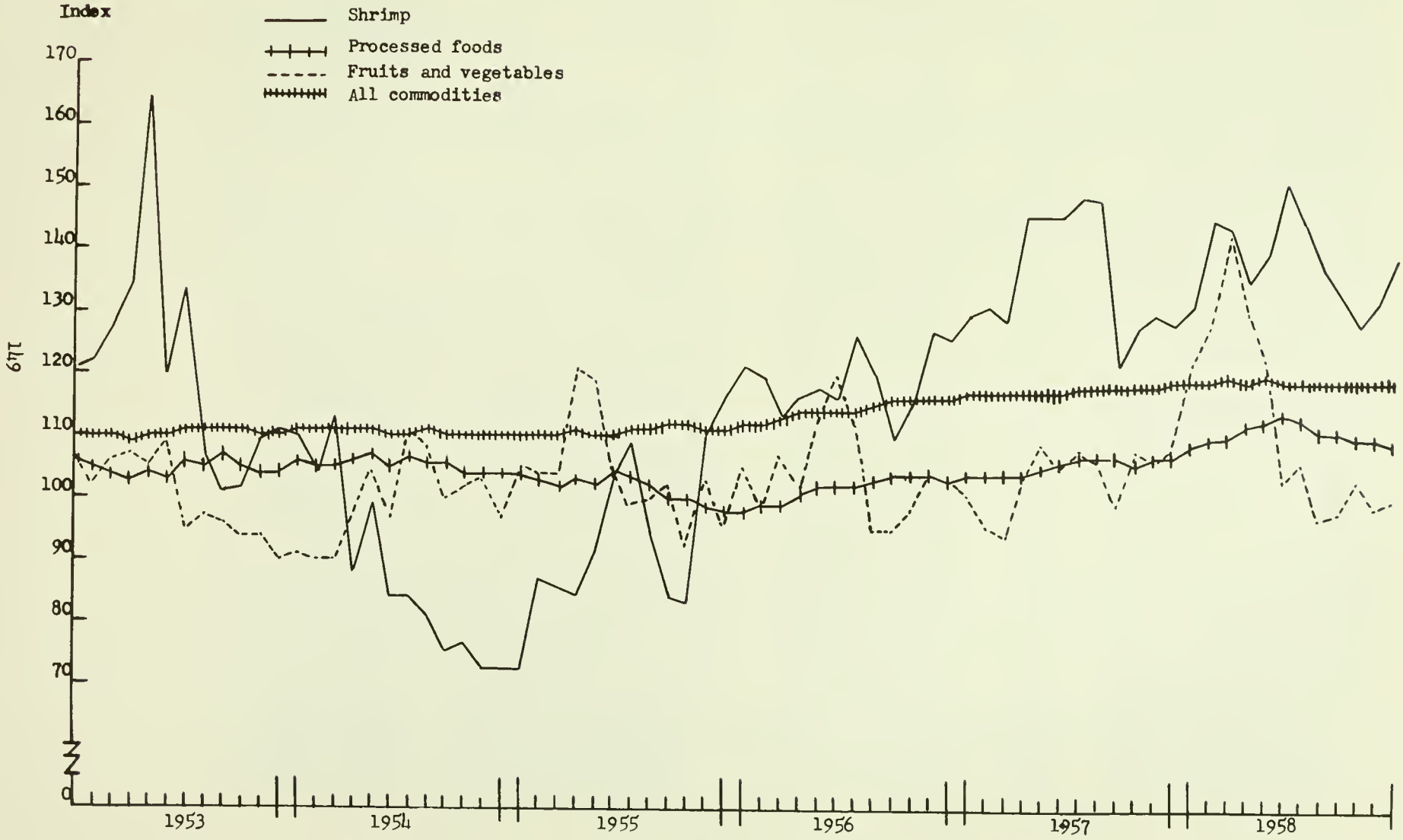


FIGURE IX - 35.--WHOLESALE PRICE INDEXES OF FRUITS AND VEGETABLES (FRESH AND DRIED), FROZEN SHRIMP, ALL PROCESSED FOODS AND ALL COMMODITIES, 1953 - 1958
(1947-1949 base = 100)



The expansion of operations in 1950 had necessitated investment in larger craft, better quality gear, and more costly specialized equipment. As long as the boats were small, the fisherman's investment in fixed assets was fairly moderate and the industry was controlled by a variable cost pattern. This made it possible to adjust operations relatively quickly to changes in market price. As fixed costs assumed a larger role, fishing operations became more vulnerable to fluctuations in the market. When prices broke in 1953 the vessel break-even point moved upwards to a greater extent than if fixed costs had not increased, as they had after 1950. Therefore it was necessary for the fisherman to increase his catch solely to meet expenses.

By reducing catch per unit of gear, the increase in the rate of additions to the fleet only served to make a difficult situation worse.

Break-even charts (figures IV - 41 and IV - 42) for vessel operations in 1953 and 1954 (the data are based on an average of 38 identical vessels for which cost information had been obtained) graphically illustrate what happened to the fisherman's business during the 1953-1954 shrimp market depression. While the average vessel with a cost and price structure similar to the one shown in the figures, broke even by catching 49,000 pounds in 1953, it had to increase its catch by over 19,000 pounds, approximately 40 percent, in order to break even in 1954.

The impact of the price break did not affect all fishermen alike. Among the most seriously affected were Florida operators, more specifically, fishermen making the long Campeche trip. Table IX - 41 shows that Campeche production throughout the year 1954 was substantially below the level of the preceding year. The decline in the catches of the Florida-based Campeche craft was such that total Florida production fell from 58.5 million pounds in 1953 to 50.9 million pounds in 1954. This despite the fact that landings of Florida craft engaged in the Tortugas fishery were higher in 1954 than in 1953, and landings of the remainder of the shrimp fleet of the State (boats unloading at upper west and upper east coast ports) were about the same in both years.

The drop in catch in the Campeche fishery is in seeming contrast with all that has been stated so far. A lowering of prices and an upward movement of the break-even point, should have contributed to an intensification of the efforts of fishermen. A rise in the number of shrimp trawls operating in the State, from 846 in 1953 to 1,090 in 1954, constitutes a further reason why Florida catch figures in 1954 should have been in excess of the preceding year.

TABLE IX - 41.--FLORIDA SHRIMP CATCH, IN MONTHS AND BY FISHING GROUNDS
1953 - 1958
(Thousands of pounds)

Year and month	East Coast	Tortugas	Campeche	West Coast	Year and month	East Coast	Tortugas	Campeche	West Coast
1953					1956				
Jan.	339	1,659	2,666	27	Jan.	619	2,270	2,187	38
Feb.	145	1,316	2,055	28	Feb.	452	2,484	1,851	13
Mar.	37	2,150	2,735	58	Mar.	127	2,906	1,650	57
Apr.	22	1,480	2,560	206	Apr.	22	2,804	1,427	169
May	50	1,415	2,657	320	May	65	2,338	2,200	572
June	143	1,541	2,421	128	June	143	1,326	1,918	459
July	317	1,566	3,229	105	July	315	448	2,325	233
Aug.	303	744	2,988	95	Aug.	319	296	1,880	106
Sept.	747	628	2,809	734	Sept.	626	230	2,054	360
Oct.	1,211	1,219	3,435	791	Oct.	878	1,544	2,608	379
Nov.	1,392	1,805	2,263	420	Nov.	1,165	2,055	2,011	326
Dec.	960	1,905	2,502	143	Dec.	964	2,026	3,401	157
1954					1957				
Jan.	418	2,748	3,059	114	Jan.	437	3,364	1,698	92
Feb.	155	2,143	1,933	34	Feb.	152	1,935	1,666	45
Mar.	67	2,630	2,197	95	Mar.	53	2,714	1,835	106
Apr.	21	1,824	1,606	288	Apr.	40	1,466	1,860	367
May	82	1,341	1,900	233	May	110	1,525	2,190	331
June	119	1,198	1,668	197	June	336	647	2,113	214
July	223	941	1,789	213	July	426	492	1,996	390
Aug.	186	993	2,338	171	Aug.	425	187	1,709	258
Sept.	572	715	1,913	660	Sept.	528	372	1,342	550
Oct.	1,258	609	1,740	308	Oct.	863	579	1,810	537
Nov.	1,156	1,239	2,373	228	Nov.	1,155	1,637	1,644	298
Dec.	820	1,893	2,364	110	Dec.	653	1,828	1,924	197
1955					1958				
Jan.	298	2,591	1,484	96	Jan.	317	2,928	1,249	35
Feb.	79	3,469	1,239	94	Feb.	201	2,167	1,457	4
Mar.	37	3,029	1,422	206	Mar.	72	3,347	1,162	38
Apr.	34	2,481	1,254	308	Apr.	6	4,148	1,107	244
May	39	1,370	1,295	286	May	8	2,952	1,107	1,037
June	97	1,869	2,308	505	June	106	1,437	1,649	465
July	333	1,049	2,965	454	July	306	403	1,074	610
Aug.	344	641	2,947	132	Aug.	308	982	1,027	201
Sept.	602	696	2,472	129	Sept.	673	1,012	1,594	436
Oct.	769	616	2,573	741	Oct.	804	1,087	1,376	346
Nov.	769	1,251	2,280	412	Nov.	1,353	2,096	2,076	311
Dec.	735	1,575	2,064	294	Dec.	829	1,491	1,714	214

Note: Central West Coast landings for April through August 1958 are not included.

The drop in Campeche production, contrary to what was to be expected on a logical basis, can be explained in one of two ways or by a combination of these factors:

If, in the year 1954, an increasing number of "Campeche" fishermen discovered that they were unable to recover trip or "variable" expenses, there is a possibility that such operators decided to discontinue fishing rather than add to their already heavy losses caused by relatively large fixed costs - depreciation, insurance, repairs, etc.

Alternatively, the drop in production can be explained by biological or weather factors. The weight of the available evidence appears to support this hypothesis. United States Fish and Wildlife Service field reports from Florida for most of the year 1954 include frequent complaints about low prices in the industry and low catches in the Campeche grounds and describe the distress caused by these conditions. In September 1954 the following information submitted by a field agent was indicative of conditions in the fishery:

> "During the period between August 1st and September 13th, a loan company in Miami refinanced 22 of the 40 shrimp boats they had financed. This example surely reflects business trends in the shrimp industry probably better than any other index."

A further proof of the biological causes of the production decline is furnished by statistics on 1954 landings of Mexican boats fishing the Gulf of Campeche which show a trend similar to the Florida operations on the same fishing grounds (see chapter on Mexico in Survey of Shrimp Fisheries of Central and South America, Special Scientific Report--Fisheries No. 235).

Operations in Texas followed a logically coherent pattern. The continued price depression, intensified efforts to meet financial obligations 17/ and the influx of new vessels, combined to bring about an increase of almost one-third (from 70,435 to 93,258 pounds) in the production of Texas shrimpers from 1953 to 1954.

17/ In September 1954 a member of the field staff of the United States Fish and Wildlife Service reported on shrimp production in the State of Texas as follows: "Production in Texas has been quite heavy with no sign of a slowdown. Present low prices would justify decreased activity were the men in a financially good position. The high notes due on much of the fleet provide most of the impetus for the present high level of activity."

On an overall basis United States landings were slightly larger in 1954 than in 1953. The maintenance of production on the high level of the preceding year served only to reinforce the downward trend in prices since dealers found it impossible to dispose of record inventories. The upward movement in ex-vessel prices had to await wholesale price improvement resulting from a low priced sell-off of cold storage holdings. By that time the discouraging experience of boat operators during the period of market depression showed its effect on potential investors in new boats. This is illustrated by new vessel registrations which in 1955 had fallen 61 percent from the preceding year.

SUMMING UP AND SPECIFIC RECOMMENDATIONS

Production Problems

The preceding chapters of this report outline some of the major problems of the shrimp industry and cover aspects of production, processing, marketing, and consumption. The reader interested in an analysis of the status of the fisheries in Continental Latin America may consult Special Scientific Report--Fisheries No. 235. Information relating to world production can be obtained in Special Scientific Report--Fisheries No. 254 entitled Foreign Shrimp Fisheries Other Than Central and South America.

Among the major problems of the fishery pointed up in the course of this survey are those related to equipment and personnel employed in fishing operations. Vessel design and construction should conform to standards evolved through the application of up-to-date techniques.

As far as inshore operations are concerned, it appears that the smaller, conventional shrimping vessels (50 feet in length or less), and the various types of motor boats are suitable in design for the work in which they are employed. The use of small, light-weight Diesel engines is economical since the relatively high initial costs (compared to gasoline engines) would be more than balanced after a short period by savings in operation. The inshore vessels seldom leave the vicinity of the home port and can be manned by local personnel who, in general, are experienced and reliable. The use of vessels over 50 feet in length in the inshore fisheries is unwarranted and may be a source of destruction to the resources.

Recommendations for improvements in vessel design, construction and operation were made by specialists working under contract to the United States Fish and Wildlife Service. These recommendations are summarized in the following paragraphs of this section on production problems.

Suggestions with respect to vessel design and construction were confined principally to the larger, standard-type shrimp boat. The contractors concluded generally that the time has come to replace the traditional Florida-type craft with a newly designed vessel possibly greater in length.

The forward sections of the vessels must be made finer, with an effective flare topside to provide a dry bow with ample reserve buoyancy. Tank tests do not indicate that a V-bottom hull could be used to advantage. The midship sections should be hardened at the turn of the bilge to overcome excessive rolling. The run aft must be flatter to provide better speeds and less critical changes in trim when loaded. Ample power must be installed to enable free running speeds up to 10 or 11 knots and more effective towing speeds. A single screw with a variable pitch propeller has been the solution in other fisheries facing the same problems. Preferably, the deck house and quarters should be moved aft, leaving the waist open as a working deck, assuring easy visual and vocal communication between it and the wheel house. The single mast could then be stepped forward of the midsection. With minor improvements the present Florida rig, which is efficient in its use of manpower, could be easily adapted for use in this new position. If possible, crews' quarters should be located topside and living conditions improved. Below, the engine room should be well aft and an insulated, refrigerated hold provided amidship near the center of buoyancy. Storage tanks for fuel and water could be so placed that the trim of the vessel could be controlled.

Although the arrangement of the deck plan would be altered, the deck machinery and rigging currently in use could be easily adapted to the new layout. A yoke or gallows could be built into the cabin top in order to properly center the towing lines. Consideration should be given to the installation of deck winches, spars and rigging of greater capacity since it is more than likely that future fishing will be done at depths greater than at present.

In addition to the recommendations on vessel design and layout, suggestions were made for the elimination of objectionable features in prevailing construction practices. Detailed recommendations are outlined in Chapter II of Volume 1. In general the suggested improvements relate to the desirability of heavier construction and more adequate fastenings.

Economic considerations bring out an important objective that should be sought in the selection of a design and construction method appropriate for the shrimp vessel of the future. Because of seasonal catch variations in the fishery careful consideration should be given to the development of a dual-purpose vessel, capable of being used in other fisheries without physical changes, or crew additions. Experimental work is now being conducted along these lines in the Gulf of Mexico and the Caribbean.

In the opinion of many experts, any large vessel to be built in the future, especially one intended for use on the long Campeche run, should be equipped for freezing at sea. The principal reasons for freezing at sea are better quality of the product and the economies effected by longer trips. Immersion freezing in a salt-sugar solution is considered by some as the best system for small vessels. The advocates of this method of freezing claim that its advantages over the plate or blast freezing systems are in reduced weighing and packaging labor. Others claim that the blast freezing system is a cleaner and easier operation.

In the future, increased emphasis will have to be placed on installing engines that are most economical for a given size of hull. One outstanding authority in the field is of the opinion that many fishing craft have engines that are more powerful than required for efficient operations. His conclusions are based on the findings of recently conducted experiments which indicate the existence of an inverse relationship between hull length and horsepower required per ton of hull weight.

Automatic pilots, depth recorders, and radio telephones are the most widely used types of electronic installations on board shrimp vessels. Unfamiliarity with the equipment, and ignorance or neglect of proper maintenance practices, are responsible for the failure to fully realize the benefits that can be derived from this type of equipment.

Long range navigation equipment--commonly referred to as "loran"--perhaps offers the most promise of all navigational aids to the fishing industry. By substantially reducing travel time to and from the fishing grounds, loran could increase the proportion of productive to unproductive time at sea and thus make operations more economical. Such a program on the part of the industry obviously must be complemented by an adequate system of loran stations operated by government.

Trawls with nylon netting have been used to advantage by some fishermen who are impressed with the durability of the material. The switch-over from cotton to nylon webbing and the use of nylon in lieu of manila roping in the rigging has resulted, in some instances, in considerable savings in gear and rigging. Some fishermen have discontinued the use of nylon netting because of difficulties which arose whenever the netting had to be mended. The more expensive nylon netting cannot be recommended wherever the nature of the bottom increases the chances of bogging or destroying nets and cod ends relatively early in the use life of the gear.

Since the efficiency of shrimp trawls is closely connected with the spread of the net, measures should be taken to increase the spread. To obtain maximum vertical spread of the net and its tending bottom the pad eye should be as near the top and bottom of the trawl boards as possible. The use of stern davits and of a special type winch will further increase the spread of the net. At present this equipment is not standard aboard shrimp boats and it may require further development before adoption throughout the fleet. A recently-developed type of flat trawl, the "Western Jib", will also give more spread and pull more easily. Finally, the double rig now operated by many vessels has already proved its usefulness.

The lack of good navigational equipment, poor maintenance of available equipment and ignorance of the fundamentals of piloting and navigation, are believed to be the main factors responsible for the loss of a large number of shrimp vessels. The observation of the fundamental principles of navigation required to assure safety at sea are apparently largely ignored throughout the fleet. Chart plots are not kept, even during long trips, and logs do not exist.

In the opinion of those familiar with shrimping operations this situation is fraught with danger and should be remedied at once.

One contractor proposed that all shrimp vessels be inspected before leaving port because of the high rate of loss at sea. Inspection of the readiness of the vessel for sea should include a careful check for seaworthiness, condition of all navigational and mechanical equipment, presence of needed devices and information, and a general appraisal of the qualifications of the personnel. Responsibility for performing the inspections might rest with an agency especially constituted for such purpose. This agency could function under the sponsorship of an association of owners and operators, insurance interests, or State or Federal authorities. It should have sufficient power to deny a vessel the right to depart from port unless properly outfitted, maintained, and manned. Despite the expense and possible loss of fishing time, it was suggested that such an agency would be of great value in preventing accidents traceable to defective equipment and incompetent personnel.

Personnel problems have been among the major worries besetting the industry in recent years. On non-owner-operated vessels, conflicts between owner and crew have been frequent. As long as the vessel owner is solely interested in operating his boat at the lowest possible economic level, he will have little regard for crew comfort and safe working conditions. Prepared to write off his capital investment in the shortest possible time, the owner concentrates on getting the maximum possible return from his operation over the period the vessel is in productive use, and tends to neglect making necessary repairs. This attitude begets a feeling of indifference, if not actual resentment, on the part of the crew whose safety is at stake. There is no pride in the maintenance or operation of the vessel nor loyalty to the owner.

Personnel changes constantly occur and interest in good seamanship is virtually nonexistent. The situation is, in part, explained by the fact that the greatly increased demands for personnel, resulting from the rapid expansion of shrimp fishing operations after 1950, could not have been met without drawing on available pools of labor which lacked training and experience.

A variety of measures to improve the quality of personnel as well as measures to provide captain and crew with a stake in the operation of the vessel, have been proposed. One of the contractors recommends the setting up of an organization with a membership representing all parties interested in the prosperity of the fishery, with governmental agencies acting in an advisory capacity. This organization should have as its task the adoption and financing of a program encompassing: (1) dissemination of educational information, (2) establishment of training programs for captains and crews, and (3) participation of captain, and perhaps crew, in the ownership of newly-constructed vessels.

The first step in this direction has already been taken. On August 8, 1956, the President signed Public Law 1027, 84th Congress, an Act to Promote the Fishing Industry in the United States and its Territories by Providing for the Training of Needed Personnel. One section of this law authorizes the Secretary of the Interior to make grants to universities for the training of professional personnel needed in the field of commercial fishing. Another provision of the act amends the Vocational Education Act of 1946 by placing responsibility for the geographic apportionment of specified funds for vocational education in the fishery trades and industry and distributive occupations connected with the industry with the United States Commissioner of Education, the latter official being expected to consult with the Secretary of the Interior to determine an equitable basis for allocation.

With Congress appropriating the funds authorized by the provisions of the Act, a comprehensive educational program to benefit the shrimp industry is beginning to be launched.

The use of personnel trained in seamanship and efficient fishing methods should lead to a reduction of repair and maintenance costs and should have a favorable effect on depreciation and insurance costs.

There are additional ways in which vessel operators may reduce their operating expenses. Through proper insulation of holds, ice consumption can be substantially reduced. Three inches of insulation on the hull and four inches on the deck and engine room bulkheads for wooden vessels are deemed adequate for this purpose. An additional inch is recommended for steel hulls. When holds are too heavily insulated the water film on the shrimp from the melting ice is inadequate to minimize oxidation.

On the basis of data developed during the survey, the amount of ice and fuel a vessel can be expected to consume under certain types of conditions was obtained. The tabulations in the body of this report give particulars for a sample of vessels whose owners were able to furnish needed statistical information. The fuel and ice consumption rates furnished are approximations, and it is difficult to generalize on the basis of the limited amount of data available. The variables that must be considered in connection with consumption rates per hour, fishing day (or night), season, year, or per pound of shrimp caught, are too numerous to set up fixed consumption rates on scanty observations.

The shrimp fishery has at times suffered from credit strictures, particularly in financing vessels. The Fisheries Loan Fund, established by the Fish and Wildlife Act of 1956, provides a source of loan funds to fishing vessel owners and operators. The Fund does not compete with private banks or other lending agencies and each applicant must furnish proof that the financial assistance needed is not otherwise available on reasonable terms.

In March 1958, all functions of the Maritime Administration pertaining to Federal Ship Mortgage Insurance for fishing vessels were transferred to the Department of the Interior. Under a program administered by the Bureau of Commercial Fisheries, mortgages and loans may be insured for the construction, reconstruction and reconditioning of fishing vessels.18/

Some attempt should be made to obtain a lowering of the high insurance costs of shrimp vessels, which in some instances amount to as much as 18 percent of the declared value. Progress will eventually be reflected in lower premium costs, if some of the improvements suggested for vessel design and equipment and personnel training are adopted. Economies may come about in the wake of self-help action initiated by the industry. Attempts have been made recently to underwrite risks collectively. These provide for hull insurance at premium costs ranging from 4.75 to 3.25 percent of the declared value of steel diesel vessels to 5.75 to 4.25 percent on wooden diesel vessels. The rates decrease in proportion to the increase of the deductible amount. Specific recommendations for lowering vessel insurance costs are contained in the United States Fish and Wildlife Service publication Hull Insurance and Protection and Indemnity Insurance of Commercial Fishing Vessels, Special Scientific Report--Fisheries No. 241.

Shrimp Processing

Information obtained in a study of shrimp plant efficiency conducted by a private research firm for the United States Fish and Wildlife Service, has been used in the preparation of this section of the report. Existing

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18/ The Department of the Interior has this authority but until legislation pertaining to the funding of the revolving fund supporting this activity is enacted, this insurance is not being effected. The legislation was pending in the U. S. Congress on August 15, 1959.

plant layouts and procedures were studied in a number of establishments specializing in the manufacture of the more important shrimp products. On the basis of their observations and available data the surveyors were able to devise improved plant layouts and plant procedures. It is felt that if these layouts and procedures are adopted by the industry they will bring about substantial cost reductions. The findings of this survey are described in considerable detail in the body of this report. Potential man-hour savings which the individual freezing and canning plants studied could attain by adopting the recommended layout and procedures are tabulated in table IX - 42. The man-hour savings per 100 pounds of end-product are expressed in absolute terms, i.e. in fractions of man-hours (see column 2) as well as in percent of man-hours currently required (see column 3).

TABLE IX - 42.--PLANTS PRODUCING FROZEN HEADLESS AND CANNED SHRIMP: POTENTIAL SAVINGS IN MAN-HOURS PER 100 POUNDS OF END-PRODUCT AS THE RESULT OF ADOPTION OF SYNTHESIZED PROCEDURES AND LAYOUT

	Total man-hours currently required to produce 100 lbs. of end-product	Potential savings per 100 lbs.of end-product (Actual less 'Ideal' layout)	Potential savings per 100 lbs. of end-product in percent of currently required man-hours (column 2 divided by column 1)
	Man-Hours	Man-Hours	Percent
Plants producing packaged frozen headless shrimp			
Company "A"	1.093	.458	42
Company "B"	1.080	.445	41
Company "C"	.908	.273	30
Company "D"	.903	.268	30
'Ideal' layout and procedure	.635		
Plants producing canned shrimp			
Company "E"	5.015	1.363	27
Company "F"	4.768	1.116	23
Company "G"	4.324	.672	16
'Ideal' layout and procedure	3.652		

General Economic Considerations

From the standpoint of the market and the future course of the industry the problems connected with supply are paramount. Since shrimp probably will not be cultivated on a mass scale, supplies for the anticipated increase in future consumption will depend on the continued abundance of shrimp in waters presently fished, on the discovery of new fishing grounds, and on expanded imports. The domestic market situation will depend on whether or not enough shrimp to satisfy growing demand can be transported economically from all sources to centers of consumption.

Total supply requirements in 1975 as estimated in Chapter VIII will be well in excess of 450 million pounds (heads-on) of shrimp.

Production of the domestic fleet in recent years has approximated 250 million pounds annually. Since exploitation of currently fished domestic grounds probably cannot be intensified without at least some harmful biological or economic consequences about one-half of the total market supply in 1975 will have to come from other sources.

The discovery of the deep-water resources of Royal Red shrimp (Hymenopenaeus robustus) would indicate that additional supplies may become accessible to domestic shrimp operations as the result of exploratory activities. Since it is unlikely that other grounds as rich and as conveniently located as those off the Dry Tortugas and in the Gulf of Campeche have remained undiscovered, exploratory operations in "local" waters will shortly reach a stage of diminishing returns. As the supply decreases more emphasis will be placed on exploration in distant waters.

Intensified domestic exploratory activities will be paralleled by a search for economical and dependable sources of imports. Shrimp imports have been growing at a rapid rate in recent years. Their volume rose from 5 million pounds in 1940 to 40.2 million pounds in 1950 and 85.4 million pounds in 1958. In the past, Mexico has accounted for the bulk of the supplies brought into this country. As pointed out in the related report dealing with the shrimp fisheries of Latin America, the Mexican industry today is believed to be operating near the limit of its potential. A supply deficit at some future date, therefore, will have to be made up from other sources. Other countries to the south may be able to fill the gap in part. The long-range potential of the Latin American shrimp fisheries has been estimated to be 200 to 300 million pounds a year, as against a current production of about 125 million pounds. There is no way of estimating whether--or-when--this potential will be reached.

The waters off India and other overseas countries appear to have substantial and relatively little-exploited resources. Before these distant fisheries can be properly assessed as potential sources of supply it will be necessary to determine whether the shrimp are of a quality and can be made available at a price acceptable to the American consumer.

It is unrealistic to discuss in an academic fashion the possibilities of raising imports without reference to the socio-economic framework of the segment of the country specifically affected. A consensus with respect to the import question will be difficult to obtain because of the different complexion of the industry in the various states. There may even be some disagreement between different interest groups within a local area. Thus, fishermen, processors, and distributors may be inclined to differ with each other on the import policy that should be followed by this country. As long as consumer demand holds up, the fisherman has little reason to be alarmed over the trend in imports. As long as imports contribute to the stabilization of prices and prevent the precipitous influx of operators desiring to profit from temporary scarcities, the fisherman has reason to welcome imports. In a declining market, however, the fisherman will worry about "cheap" foreign competition. Similarly, the attitude of processors and wholesalers will change in accordance with the manner in which changing economic conditions affect their interests. Since no duty has ever been devised which was successful in satisfying everybody concerned, a long-range policy with respect to tariffs on shrimp products cannot be charted. In a country where democratic processes prevail, a tariff policy should take cognizance of the interests of all parties. Because of their large number, consumers probably have a greater right to have their interests protected by the Government than anyone else. At present shrimp comes in duty-free whether imported as a frozen headless, canned, or otherwise processed product. It is not difficult, however, to think of circumstances when temporary gluts or other economic conditions in a segment of the industry would make the imposition of a tariff seem desirable.

In the past, attempts to overcome shortages of supply have added to the problems of the fisherman. Wherever a year-round operation replaced a previously seasonal fishery, the fisherman had to adapt himself to the new situation by following supply areas, becoming in a sense a migratory worker with the attendant disadvantages of such a type of existence. The need to invest in larger craft, better quality gear, and more specialized and costly equipment, created additional problems. As long as the boats were small, investment in fixed assets was fairly moderate and the industry was controlled by an easily variable cost pattern. It was possible to adjust quickly to changes in market price. As fixed costs rose some of the flexibility was lost, and fishing operations became more vulnerable to fluctuations in the market. The fisherman who goes to the Campeche grounds must not only make sure he catches enough shrimp to make his trip worthwhile but must have certain assurances that

after his departure from port a precipitous drop in prices will not threaten to bankrupt him. The fishery may still sustain serious damage even when the independent boat owner is financially strong enough to weather the shock of a severe market setback. The individual crew member, whose income depends on receipts for the shrimp landed, usually does not have cash reserves and is forced to seek employment elsewhere. This deprives the fishery of one of its principal assets, a trained and efficient labor force.

Of equally disastrous consequences to the industry as the loss of a skilled labor supply is a phenomenon associated with "good times". Each announcement of the discovery of new shrimping grounds, and each season of profitable operations, usually is accompanied by a huge expansion in vessel operations. This must be attributed partly to an overenthusiastic boat building program and partly to the influx of outside elements who enter the shrimp fishery while business is good.

The case study in the first part of this chapter dwelt on the difficulties created by such a situation. There are measures that can be taken whenever the conditions which were responsible for the 1953-1954 debacle threaten to reoccur.

In general, the objective sought by the industry is: to make available to the public a high quality product at prices low enough to encourage consumption, while at the same time permitting the efficient producing unit to remain in business. An achievement of this goal is impossible without the constant exercise of discipline on the part of all segments of the industry. A healthy market situation cannot be maintained unless production and prices stay at a level which simultaneously protects the resource from harmful biological consequences, the fisherman from losing his livelihood, and the processor and distributor from losing his customers as the result of immoderate price advances. To prevent biological and economic "overfishing", ways and means must be found to curb the tendency to intensify fishing effort when the price level is depressed, as well as the mushroom expansion of operations usually following in the wake of "good times". Signals presaging oncoming troubles are not too difficult to recognize. They may include: unusually large or meager runs of shrimp, accumulation of inventories beyond seasonally justifiable levels, abnormal new vessel registrations, etc. Means to combat short-sighted selfishness or ignorance of the economic consequences of the individual's actions are much harder to devise. Voluntary self-control is desirable but unattainable in practical terms since concerted action tends to conflict with the provisions of anti-trust statutes and may ultimately harm the consumer. Regulatory measures by state conservation agencies acting upon the recommendations of an advisory body composed of all parties with an immediate interest in the prosperity of the fishing industry show the greatest promise. The creation of an organization of this sort was recommended in connection

with the problem of raising personnel qualifications in the fishery. An extension of the scope of operations of such a body to include functions relating to the study of markets would seem to be logical.

Seasonal supply and inventory increases of unusual size must be met by the wholesale and retail trade by stepping up promotional activities to assure faster turnover. The potential benefits to be derived from stepped-up advertising, broadening of product line, and better quality control, were pointed up in the course of a merchandising experiment conducted in four metropolitan centers, and described in Chapter VII of this report. It should be noted that the best results can only be obtained when retailers and wholesalers fully cooperate.

Another means of stabilizing supply and prices would be through conclusion of an international commodity agreement with foreign countries, notably including Mexico, our most important foreign supplier.

Some thought should be given to the establishment of futures trading in shrimp products. Hedging on a commodity exchange tends to reduce fluctuations in price due to seasonal ups and downs in production. Before trading in futures could become a reality the basic requirement of universally accepted standards of grade and quality must be met. In the past, establishment of a futures market for shrimp has been handicapped by the absence of such standards for the more important shrimp end-products. This situation is gradually being remedied. With standards for frozen raw breaded shrimp now promulgated by the Department of the Interior, consideration can be given to developing standards for other related items. As soon as quality standards are available for the bulk of manufactured shrimp products, the major hurdle in the way of the establishment of a futures market in shrimp will have been eliminated.

SUBJECT INDEX

("II" indicates the page is in Volume II, all other page references are in Volume I.)

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