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MECHANIZING THE BLUE CRAB INDUSTRY

Part I - Survey of Processing Plants

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ABSTRACT

This article summarizes the information obtained in a survey of over 60 plants in the blue crab industry. The main objective of the survey was to determine the need for mechanization and the type of machines needed. The plants surveyed included most of the medium-sized and large plants and some of the smaller plants. In the selection of the plants, the geographical distribution of production was considered.

It was concluded that the industry was in serious need of aid and that mechanization of the hand operations of debacking, cleaning, and picking offered the best long-range possibility of profitable operation under the eventual $1.25 per hour minimum wage required by law. A group or "family" of four machines to separately (1) deback the crabs and clean cores, (2) pick lump meat, (3) pick body meat, and (4) pick claw meat was considered the best means of providing the varying levels of mechanization that are required by the industry, due to the very large range in size and economic condition of the industry's plants.

INTRODUCTION

The blue crab industry has changed very little during the 75 years or more that crab meat has been picked and marketed in the Chesapeake Bay region. Now, as in the beginning, crabs are loaded into retort baskets, batch-cooked in steam or in boiling water, and cooled. After the cooled crabs have been debacked and cleaned, the body meat, the lump meat, and the claw meat are picked out separately into cans or pans. Finally, the weight per can is adjusted to an even pound, and the cans are capped and iced for shipment to market.

Each of those steps is a hand operation. When the Fair Labor Standards Act Amendment of 1961 required the fresh crab meat industry to pay the workers a $1.00 minimum hourly wage, every plant that produced crab meat was affected adversely by the resulting increase in cost of production. Since many of these plants were already operating with only marginal profit, it appeared likely that this increased cost would force many of them out of business.

To circumvent this possibility, Congress provided a special appropriation to the U. S. Bureau of Commercial Fisheries to be used primarily to investigate the mechanization of part or all of the industry's hand operations. In order that the work could be completed quickly and efficiently, the Bureau decided to make use of the practical experience and special knowledge of a private research organization with prior experience in the problems encountered in mechanization. The work to be undertaken by the research organization selected was:

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Note: Part I will be followed by Part II ("Measures for Immediate Relief Through Worker Specialization") and Part III ("Strengthening the Industry's Economic Position"), in subsequent issues of Commercial Fisheries Review.

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1. To conduct a survey to determine if mechanization was feasible.

2. If mechanization was feasible, to make recommendations for the optimum level of mechanization.

3. Also, even if mechanization was feasible, to recommend stop-gap measures for immediate relief until machinery for mechanization could be developed and manufactured.

After reviewing proposals from many potential contractors, the Bureau chose Reed Resear Inc., Washington, D.C. (now American Scientific Corporation, Alexandria, Va.), to carry ou this project, and the work was started on October 11, 1961.

The contractor visited more than 60 plants throughout the blue-crab producing area to (1) observe methods of production and kinds of equipment used and (2) discuss with the managers of the individual plants the problems created by the minimum-wage law. The purpose of the present article is to report the findings of this comprehensive survey of the industry by the contractor.

In the present article, the organization of the survey is first described, the results obtained are reported, and then the contractor's conclusions regarding the optimum level of mechanization for the industry are given.

ORGANIZATION OF THE SURVEY

To assure representative geographical coverage, the contractor divided the producing area into five districts, as follows: (1) Maryland; (2) Virginia and North Carolina; (3) South Carolina and Georgia; (4) Florida; and (5) Alabama, Mississippi, Louisiana, and Texas. In each district, plants to be surveyed were selected in such a manner as to (1) include a few of the small plants, (2) include all of the limited number of large plants, and (3) include most of the medium-sized plants (those having from 25 to 50 pickers). The last group comprised the majority of the plants visited, since they are of greatest importance from the standpoint of production. The districts, the approximate number of plants in each (the number operating varies seasonally and from year to year), and the percent of the plants in each district that were included in the survey are as follows:

1. Maryland (50 plants)--28 percent.

2. Virginia and North Carolina (55 plants)--33 percent.

3. South Carolina and Georgia (10 plants)--40 percent.

4. Florida (40 plants)--43 percent.

5. Alabama, Mississippi, Louisiana, and Texas (33 plants)--27 percent.

RESULTS OF THE SURVEY

In this section of the article are described the handling and processing steps used in the industry, the variations encountered from one plant to another, and how the plants were classified in order for the contractor to arrive at his conclusions regarding the optimum level of mechanization for the industry.

HANDLING AND PROCESSING STEPS: The various handling and processing steps include catching, weighing, cooking, cooling, picking, packaging, and disposing of the waste.

Catching: Depending on the season, on regional preferences, and to some extent on State regulations, crabs are taken by traps (crab pots), trot lines, dredges, scrapes, and dip nets. The vessels used are small (with the exception of some used in the lower Chesapeake Bay);

ormally, fishing is a one- or two-man operation. The gear is relatively inexpensive. Crab ots are frequently furnished by the packer. This service tends to create an obligation for he crabber to sell his catch to that particular packer.

Except for such ties as these, the crabbers are usually independent. Very few plants own nd operate the catching boats. The plants thus have little control over the supply of live rabs. More often, the reverse is true--the plants have to buy all crabs brought to them dur- g periods of glut in order to obtain a supply of crabs during periods of scarcity. The price luctuates in close relation to the supply and may vary from $3 per bushel when crabs are e ntiful to $9 per bushel when they are scarce. Size and condition of the live crabs also in- luence the price paid.

Weighing: In most plants, the baskets of live crabs are hoisted from the crab boat, eighed on the dock, and dumped directly into the retort baskets. A few plants wash the crabs efore they go to the cooker. Culling out dead crabs at this point is rarely done, although he large fat "jimmy" crabs, which can be sold at a much better price as whole "hard" crabs, ay be separated. Normally, as the pickers or debackers open the cooked crabs, these orkers are able to identify and discard the crabs that had died before they were cooked.

Cooking: Although the effects of variations in time, temperature, and raw material on ield and bacteriological quality have been investigated by the University of Maryland at its eafood Processing Laboratory in Crisfield, cooking is still carried on largely by rule of humb in most plants. A few plants (mainly in Mississippi) cook their crabs in boiling water, ut this practice is prohibited by the Health Departments of several States. Most plants ook with steam at 15 pounds pressure. Vertical retorts are most common. Retort baskets olding 450 to 500 pounds of crabs are handled by a chain hoist on an overhead track. Hor- zontal autoclaves are also used and permit handling the crabs in small cars.

Cooling: After being cooked, crabs are cooled in one of several ways. In some plants, he crabs are simply held in the retort baskets overnight at normal air temperature or are oved to a refrigerated holding room after preliminary air cooling. Air is sometimes cir- ulated over the baskets of hot crabs by large fans, or the crabs may be dumped onto large oncrete tables and sprayed with water. This last practice is common in the South, where he crabs are debacked and cleaned very soon after being cooked. Although the cleaned cores ay be picked immediately, in some plants they may be held in chilled storage until the fol- owing day.

Picking: The cost of picking accounts for about one-third of the total cost of fresh rab meat. Now done almost entirely by hand, picking was considered to be the only step in hich major economies were possible through mechanization. Actually, picking comprises, ot one, but 3 or possibly even 4 distinct operations. These operations are separated in arying degrees in present practice. In the Chesapeake Bay region, the picker debacks and leans the crabs and picks the lump and flake meat, but a separate picker usually picks the laws. In the South Atlantic and Gulf Coast States, a separate group of workers debacks, leans, and may wash the crabs--the pickers getting the cleaned cores. Claws are picked eparately, sometimes by the Harris machine[1/], which utilizes the principle of separating he meat by brine flotation. In a few plants where pickers remove only the lump meat from he cleaned cores, a greater degree of specialization of hand operation is reached. In such n operation, two separate Harris machines are used--one to "pick" the claw meat and the ther to "pick" the residual body meat. The output of the Harris machine is, however, used nly for specialty products (crab cakes, deviled crabs, etc.) or for canning, as the meat ob- ained is too finely shredded to compete with the meat obtained by hand picking. Also, the rine flotation involved in the machine operation and the extensive washing needed to wash way excess salt is said to leach out most of the delicate crab flavor.

Crab pickers vary widely in speed as well as in efficiency. Often, high speed is obtained t the expense of yield. When live crabs are costly, the fastest picker, if he is not efficient, ay not be a desirable employee. A few pickers work both rapidly and efficiently. Selecting

1/ U.S. Patent Nos. 2,858,223; 2,608,716; 2,652,588.

pickers with special skills and balancing work teams of specialized pickers is the basic principle of the contractor's recommendations for effecting economies with the present hand-picking practices. This principle will be discussed in detail in Part III of this series of reports.

Packaging: In some States, regulations require that crab meat be picked directly into the can. The individual picker then takes the filled cans, usually five at a time, up to a central scale and adjusts the weights. In other States, the meat may be picked into pans and then weighed in the packing room. Most fresh crab meat is marketed in snap-top 1-pound cans, although meat to be used for specialty products is now frequently packed and shipped in 3- or 5-pound heat-sealed plastic bags. If the meat is to be pasteurized, it is picked directly into cans that can be hermetically sealed.

Fresh meat in bags or cans is immediately well iced in barrels or in wheeled carts. The iced meat is removed to a cold room if it is not shipped promptly, as the storage life of the fresh picked meat is short at best--usually less than 10 days. Meat that is to be pasteurized must also be heat-processed promptly to obtain a good-quality product. After being processed, the cans of pasteurized crab meat are cooled, placed in storage, and held at 33°-38° F. at which temperature good quality is maintained for 6 months or more, provided that the crab meat has been handled rapidly and carefully prior to being pasteurized.

Disposing of the Waste: The yield of picked meat varies considerably; but on the average about 85 percent of the weight of the live crab becomes waste. A few of the large plants have scrap dryers to convert this waste into crab meal containing 30-35 percent crude protein. The meal finds a limited market as a supplement in poultry food, and some is sold for use in mixed fertilizers. Sometimes scrap dryers are located near groups of plants so that it is economical to collect and truck the waste from several plants to a central dryer. Most of the isolated plants, however, still dump their waste into adjacent waters, sometimes giving it a preliminary coarse grinding so that the material will be more readily carried away by the tide. A few plants report that they give or sell the waste to pig farmers, although there seems to be some question as to whether or not the large amount of shell (mostly calcium carbonate) present in the waste is deleterious to the pigs.

VARIATIONS WITHIN THE INDUSTRY: As the survey progressed, the contractor became increasingly aware that there were many more differences between plants than simply variations in equipment and handling methods. Some of these differences, which assumed unexpected importance, will be discussed below and then in more detail in the later section on economic analysis of the industry (Part III). Here, we consider briefly the crab supply, plants, management, labor, products, and markets.

Supply of Raw Crabs: Next to the cost resulting from the large amount of labor required to pick the meat, the uncertainty in the supply and the cost of the raw material constitute the greatest obstacle to operating a crab plant at a profit. As already indicated, most of the crabbers are independent or are only loosely associated with any particular plant. Thus, when crabs are scarce, buying is highly competitive, and prices for raw crabs may exceed the price at which the picked meat can be sold at a profit. In glut periods, prices of raw crab are lower, but the price of the product likewise is depressed. Furthermore, the short shelf life of the fresh product causes losses when the supply temporarily exceeds the demands of the market.

Plants: Almost without exception, crab plants are located on or near the waters, as the industry largely depends on dockside delivery of live crabs. With the exception of a few of the larger companies, the plants are old, and the buildings are depreciated. Less than one-third of the plants possess modern office facilities. Except for some modern boilers and a few Harris machines, equipment is old. Despite this fact, however, the cleanliness of the plants reflects the fact that managers are keenly aware of the need for careful sanitation. All plants are licensed annually by local, county, or state health authorities and are subject to unannounced inspection. As a result, clean-up after the pickers finish work is a universal practice, and with few exceptions, is very good to excellent.

Management: As previously indicated, little effort is expended to promote the product. In most plants, the volume of production is static. If seasonal fluctuations or other factors that affect the supply of raw crabs are disregarded, the output of fresh crab meat has increased only slightly in recent years and at a far slower rate than that of other manufactured seafood products.

The contractors found no evidence of planned programs for expansion, mergers, or research and development, although such programs may exist for a few of the large companies. Plants are usually owned by a single family or are closed corporations. Several members of a family sometimes own plants that operate in competition.

The owner usually acts as the plant manager so that supervision rests entirely in one man. In the few plants in which there is absentee ownership, the resident manager has full authority for plant direction. Managers are almost always trained by growing up in the business. Thus, their knowledge of finance, production, sales, and handling of labor is acquired by dealing with these problems directly.

Only 10 percent of the plant managers interviewed were considered to be "growth oriented;" the remainder seemed to be content to hold the present volume of production. However, 70 percent were considered to be "machine oriented"--that is, ready to accept and use automatic machinery to replace the time-honored hand-picking operation.

All of the managers thought in terms of a quality product, but they varied greatly in their definition of quality. To some managers, quality meant "clean," or "safe," reflecting the emphasis on sanitation and resulting, no doubt, from the use of bacteriological standards in some of the big-market areas. To a few other managers, quality merely meant "edible." Hardly any managers thought in terms of standards for such important factors of quality as the amount of cartilage (called "bone" by the industry), the size of the lump, or the proportion of true lump meat to smaller pieces (flakes) in the lump, backfin, and special packs.

Labor: Much of the discussion with plant managers concerned labor problems. The nature of the problem differed widely from place to place. The basic reason for many of the difficulties was readily apparent. Crab picking is seasonal and, furthermore, is irregular even during the season. Some days, if the weather is bad, there are no crabs. Next day, the pickers may work 6-8 hours. The rate of pay is low--on the former piece-work basis, some workers made barely 50 cents per hour, with the maximum earnings probably being $1.25 per hour. Consequently, few pickers rely on this work as their sole income. It is almost always a source of supplementary income, so few young workers are attracted to this occupation. A great many of the workers are 50 years of age or older. The labor force is predominately women.

Because little effort is being made to train new crab pickers, the available supply of pickers is declining in many areas. This short supply of labor tends to put the plant owner at the mercy of his labor force. As in his relation with the crabber, he finds it difficult to influence the pickers in any way. Both are independent, can easily work for another plant, or can go on relief. To obtain their cooperation, the plant owner must handle them with considerable understanding.

Product: About 40 percent of the crab plants visited shuck oysters during the off-season (in the Chesapeake Bay region) or handle shrimp or fish as well as crab products. Moreover, all live crabs are not cooked and picked. Some of the other products marketed by the crab plants--in addition to the various styles of fresh or "chilled" crab meat variously termed lump, backfin, backfin lump, special (lump topping on flake), regular or flake, claw, and cocktail fingers (lump claw meat with the small claw attached)--are as follows:

Pasteurized Crab Meat: Properly handled, pasteurized crab meat is only slightly different in taste and texture from the chilled meat and has a greatly prolonged cold-storage life. More lump meat than other styles is pasteurized because this high-priced product is better able to absorb the extra cost of processing and storage. The amount of pasteurized

meat produced can only be estimated, as it is not separately recorded in U. S. Bureau of Commercial Fisheries statistics. One estimate places production of pasteurized meat at no more than 10 percent of the total production. More crab meat than usual is pasteurized during glut periods when the market cannot absorb all the fresh pack. Frequently, one plant will pasteurize part of the pack of a neighboring plant not equipped for pasteurization.

Canned Crab Meat: Canned, completely heat-processed meat is not usually considered to be as palatable as either fresh or pasteurized meat, and the small production is mainly marketed in inland areas where fresh crab meat has been almost unknown because of its highly perishable nature. The Inland States represent a large potential market for pasteurized meat.

Frozen Crab Meat: Frozen crab meat retains the natural flavor and texture of fresh meat for only a limited time. Freezing is thus usually used as an emergency method of holding excess production for short periods of up to 6 weeks.

Hard Crabs: Whole crabs, either alive or cooked, are very popular in some coastal areas, and although they are sold almost entirely to local restaurants or to individuals on a "carry-out" basis, this trade may attain a considerable volume. Only the large jimmy or male crabs are sold as hard crabs, and bring a high price. Whether they are separated by the crabber or by workers at the plant, this procedure tends to reduce the cooked yield of the remaining crabs, since the yield of meat from the smaller crabs is not as great.

Soft Crabs: The so-called soft crab or soft-shelled crab is a transient stage in the development of the crab, immediately following the molt. After only a few hours in the water, the soft crab becomes a "buckram," which is too leathery to eat, and soon afterwards develops its normal hard shell. A few crab-picking plants handle soft crabs, but the skills involved are so different that this is usually a separate business.

Specialty Items: As already mentioned, a considerable amount of bulk crab meat is used in mixtures such as deviled crab, creoles, crab cakes, shrimp stuffed with crab, and other products containing crab meat. These products can be and usually are marketed frozen. A few of the picking plants make their own specialty products. Although this outlet has expanded rapidly in recent years, it has not yet reached its full potential.

Market: The main markets for fresh and pasteurized crab meat are the big cities of the East Coast. Baltimore and New York are the most important, with Philadelphia, Washington, Norfolk, and Boston also constituting large markets. Much of the meat is sold under contract to large restaurants and hotels, and a large quantity is retailed through the food-store chains. Many of the medium-to-small plants in more isolated areas, however, sell most or all their pack through commission agents.

There is very little actual effort to "sell" the product--no advertising, institutional promotion, or other concentrated effort is made to expand the market. An exception has been the specialty products previously mentioned. These frozen "convenience foods" are usually promoted and marketed much more widely, sometimes on a national scale. The processors of these products have led the way in trying to increase the popularity of crab meat in inland areas where the fresh product has heretofore been virtually unknown.

Classification of Plants: After the survey was completed, the information obtained was used to group the plants in each area into four categories. Each plant was scored on the basis of a maximum of 25 points each for (1) progressiveness and competence of management, (2) capacity (size) of plant, (3) innovations in operational or marketing practices, and (4) geographical locations (to avoid one-sided groupings). Group 1 was plants scoring 80-100; group 2, 60-80; group 3, 40-60; and group 4, less than 40 points. These plants, grouped by district, were distributed as shown in table 1 on page 7.

Group 4, comprised of plants scoring less than 40 points and generally employing less than 12 pickers, was the only one considered not to be qualified for inclusion in the general

mechanization program. Even some of the plants in this category, however, could benefit from partial mechanization. The study indicates that the groups overlap considerably and that mechanization is feasible for all--but on a decreasing scale, with limitations imposed, not only by the size of the plant, but by the ambitions of the managers and their ability to plan and finance a program of this type.

Table 1 - Distribution of Plants in Each District, According to Group

District	Plants in:			
	Group 1	Group 2	Group 3	Group 4
	(Number)			
1. Maryland	3	4	4	3
2. Virginia, North Carolina	1	5	7	5
3. South Carolina, Georgia	2	2	0	0
4a. Florida (east coast)	1	5	0	0
4b. Florida (west coast)	1	5	0	0
4c. Florida (north gulf)	0	1	2	2
5. Mississippi, Alabama, Louisiana, Texas	2	3	1	3
Total.	10	25	14	13

OPTIMUM LEVEL OF MECHANIZATION

The ultimate over-all objective of the project is mechanization of the crab industry to enable it to operate efficiently and profitably under the new labor-law regulations. The primary objective of the contractor's survey was to determine the optimum level of mechanization--that is, the type of machines that the industry needed and also could afford. Complete mechanization of a plant is theoretically possible, but few plants in any industry are completely automated. Ordinarily, there is some point above which the cost of automation exceeds the savings that can be obtained by eliminating labor. One purpose of the survey was to establish this point for the crab industry.

A "mechanization profile" was first developed, showing the steps in handling crabs from dock to shipping truck, and the nature of each of these operations (that is, hand, hand tool, hand-controlled power tool, etc.). A chart was prepared for each plant and the information was summarized. This detailed and confidential information was used to evaluate the survey and formed the basis for the recommendations which follow. Because of the nature of this information, it cannot be presented in an article of this type.

Obviously, the problems presented in mechanization of a whole industry are more complex than for a single plant. In the plant survey, 14 basic operations (fig. 1) were found combined in 15 different and distinct systems of handling and processing. Moreover, the plants surveyed ranged in size from one employing only 3 pickers to one employing almost 100 pickers.

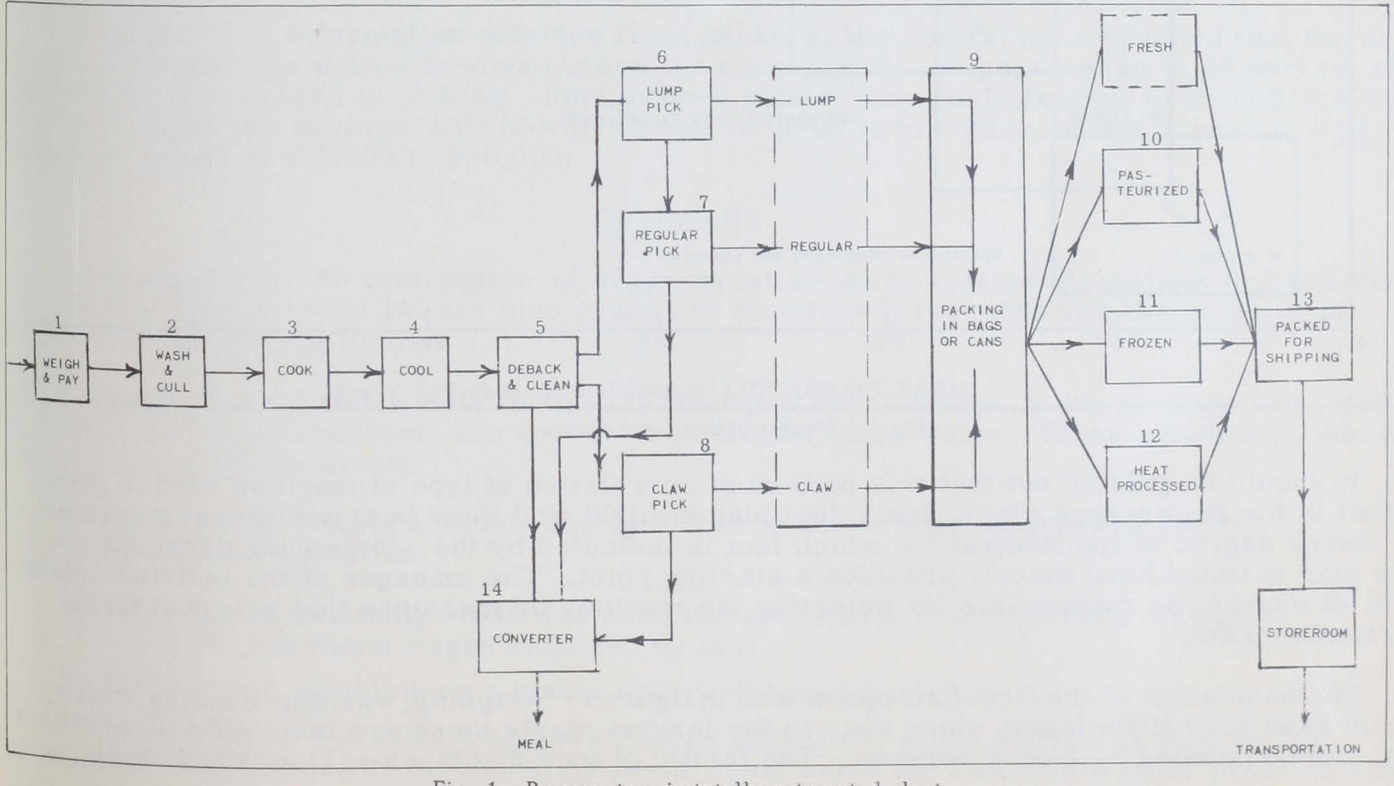

Fig. 1 - Process steps in totally automated plant.

A satisfactory plan of mechanization would be one that is flexible enough that plants of all sizes could benefit and one that, as the profits generated would permit, the degree of mechanization could be increased without making already installed machines obsolete. A series of "family" of machines that could be used separately or in any combination seemed to be the best approach to meet these requirements.

THE FAMILY OF MACHINES: Each of the 14 operations shown in figure 1 represents a function that can be performed: (1) by man alone, (2) by man and machine, or (3) by machine alone. With these three combinations, many levels between the two extremes are possible for all 14 operations. In figure 2 is shown the manner in which the contractor's solution of a family of machines is applicable to the whole industry. It will be seen that the small plants processing up to about 200,000 pounds of crab meat per year (21 percent of the total number of plants) could use a mechanical debacker. Slightly larger plants handling up to 275,000 pounds per year could add a mechanical claw picker, and so on.

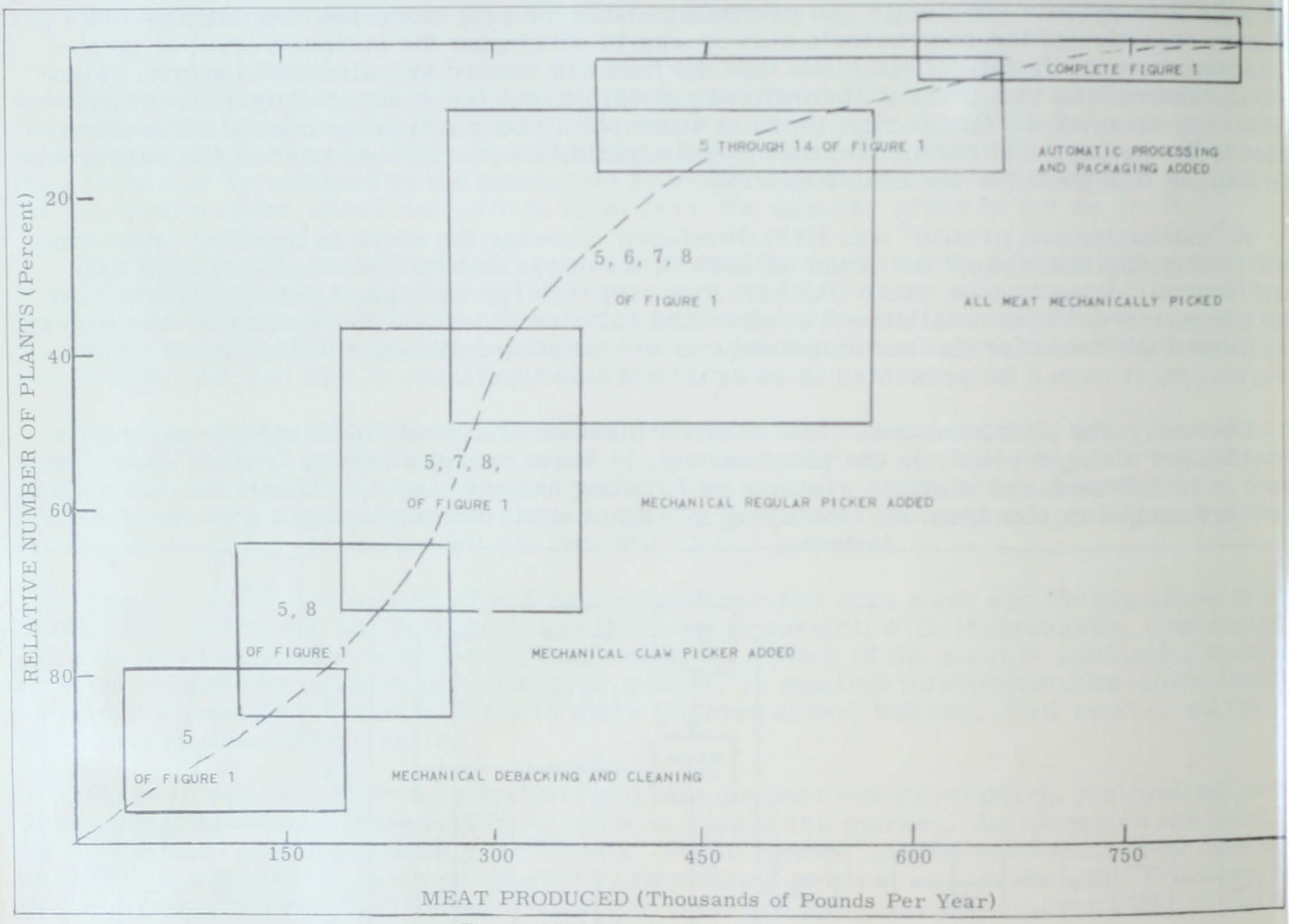

Fig. 2 - Mechanization-level curve.

It should be pointed out that this pattern of correlation of type of machine used to plant output is for the average plant. Individual plants might find their best solution at a greater or lesser degree of mechanization, which fact is indicated by the overlapping of the blocks. The plan outlined here merely provides a starting point. The manager of the individual plant will, of course, be responsible for selecting the machine or machines that will best fit his particular plant.

Mechanization of the first four operations in figure 1--weighing, washing, cooking, cooling--would save very little labor, since even in the largest plants these are intermittent operations that can be handled by 1 or 2 workers. The family of four machines--(1) a debacker-cleaner-

(2) a claw picker, (3) a body-meat picker, and (4) a lump-meat picker--would mechanize operations 5 through 8 of figure 1, and would, in combination, provide a degree of mechanization equal to that of any other seafood industry and would be the machines most valuable in enabling the crab industry to become optimally mechanized. Automation of block-5 steps (operations 9 through 14 of figure 1)--that is, packing in cans or bags, canning, pasteurizing, freezing, waste drying, and packaging for shipment--would mainly contribute to improve sanitation and would thereby allow an expansion of the present market. Machines, however, are already available for most of these steps, so no additional work on mechanization of these operations seems called for by the contractor. Furthermore, only about 10 percent of the plants would benefit directly by the automation of operations 10, 11, 12, and 14 of block-5, since these are special process steps usually found only in the larger plants.

PRIORITY OF MACHINE DEVELOPMENT: Within the "family" of the four machines decided upon as adequate to reduce processing costs, it was necessary to establish a priority of developmental effort. The debacker-cleaner machine was chosen as the machine to be developed first. This choice was dictated by the following considerations:

1. A workable machine for separating claw meat (the Harris machine) is already available and in use.

2. The lump-picker machine (a) will be the most complex in design and will therefore present the greatest problems, (b) will probably be the most expensive, and (c) will probably require the most time for development.

3. In a choice between the debacker-cleaner and the body-meat picker, the debacker-cleaner promises to be the simpler to develop and to be cheap enough to be bought by all plants.

4. The debacker-cleaner would free skilled workers for picking.

5. The debacker-cleaner would result in a minimum of supply and marketing problems, since it would not lead directly to the increase in meat production that could follow general use of a rapid and efficient meat-picking machine.

On the basis of information obtained from packers, the contractor estimated that the use of two machines--the debacker-cleaner and the claw-picker--might save up to 40 percent of the labor costs involved in picking. For group-2 plants, this would amount to from $10,000 to $20,000 in annual savings, half of which could be used to amortize, over a 5-year period, machines valued at $25,000 to $50,000.

SUMMARY

A survey of over 60 crab plants of representative sizes located throughout the Atlantic and the Gulf Coasts areas (where blue crabs are processed) revealed that the industry is faced with economic difficulty.

Although plants differ widely in size, in management attitudes, in the process used, and in other ways, some problems are encountered almost universally. These common problems are of three types, involving:

1. Difficulty in getting a steady supply of raw crabs at a price that will permit profitable operation.

2. Difficulty in obtaining labor that can produce rapidly and efficiently enough to earn the minimum wages required by law.

3. Difficulty in establishing a better approach to marketing.

Mechanization of the debacking and cleaning operation, which usually is done by the pickers, as well as of the picking operation itself would solve the immediate labor problem and

would raise the average profits above the present marginal level. The contractor considere that at least partial mechanization was feasible in all but the very smallest plants. To obtain the desired flexibility, the contractor recommended the development of a family of fou machines. This plan would enable small as well as large plants to benefit, also enable management to mechanize their operations progressively as increased profits permitted, and d this without obsolescense of machines purchased in the early part of the program. He suggested that the initial effort should be concentrated on the development of a machine for debacking and cleaning the cooked crabs. This machine would be followed by the development of a machine for picking body (flake) meat. Because the machine for picking lump meat pro ably would find use in only about 30 percent of the plants, its development would be deferre until last. For claw picking, it is expected that the existing Harris machine would be used.

BOOKLET ON "HOW TO COOK CRABS"

Crabs are one of our popular shellfish because of their tender meat and distinctive flavo Crab meat also is an excellent source of high-quality proteins, vitamins, and minerals neede for good nutrition. Modern processing and marketing methods now make crabs available almost everywhere in the United States. Crabs are available in these market forms: live cooked in the shell; cooked and frozen; fresh cooked meat; and canned meat.

As the booklet explains, four principal kinds of crabs are taken from the marine water of the United States and Alaska. From the Atlantic and Gulf coasts come blue crabs whic compose three-fourths of all the crabs marketed in this country. Dungeness crabs are found on the Pacific coast from Alaska to Mexico. King crabs come from the North Pacific off Alaska. Rock crabs are taken on the New England and California coasts. Of local importance are stone crabs in Florida and tanner crabs in Alaska.

Crab Appetizers

The four principal kinds of crabs are pictured in the booklet and their approximate weights are listed. Complete illustrated instructions are given for picking the meat from blue crabs.

Some of the easy-to prepare recipes which have been developed and kitchen-tested by U. S. Bureau of Commercial Fisheries, Fish and Wildlife Service staff of home economists are: Crab Louis, Crab Ravigote, Crab Newburg, Deviled Crab, Imperial Crab, Avocados Stuffed with Crab Meat, and Barbecued Crab Sandwiches.

Generously illustrated, How to Cook Crabs, Test Kitchen Series No. 10, may be purchase for 20 cents each from the Superintendent of Documents, Government Printing Office, Washington 25, D. C.