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## CRAB INDUSTRY OF CHESAPEAKE BAY AND THE SOUTH--AN INDUSTRY IN TRANSITION

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### ABSTRACT

The blue crab industry is in the initial stage of a fundamental change from hand preparation to machine preparation. Concurrently, it is scrutinizing its methods of capturing the crabs and of marketing the manufactured products to improve them also, and thereby ensure economic well-being.

### INTRODUCTION

The blue crab industry ranks third in value of all the food-fish industries of the Chesapeake Bay, the South Atlantic Coast, and the Gulf of Mexico Coast, being outranked only by those based on shrimp and oysters. This important industry, which furnishes employment to a large number of people has for several years, however, faced serious economic difficulty.

Owing to the complex nature of the raw material, blue crab meat is still produced almost entirely by manual methods. The solution of its economic problems, however, requires more than mechanization, for the problems extend from the high cost of capturing the blue crabs (*Callinectes sapidus*), on the one hand, to marketing the manufactured product on the other. The purpose of this article therefore is to briefly discuss those three problems.

To put the problems into perspective, we shall first consider certain background information in regard to catch. Then in the light of this knowledge, we shall consider briefly the problems at each end of the chain of operations from sea to consumer--that of capture and that of marketing. Finally, we shall consider the problem of production, which is the one that is receiving immediate attention by the industry.

### DISTRIBUTION OF CATCH

The blue crab industry was begun at Hampton Roads, Va., over 75 years ago, and for some time, fishing was concentrated along the shores of the Chesapeake Bay. During the last few decades, however, the industry has expanded, and fishing now is fairly evenly divided between Chesapeake Bay and the South Atlantic and Gulf Coasts. The total catch has fluctuated from year to year, but has been in the general range of 100 to 150 million pounds.

The proportionate share of the participating states also varies yearly, but the distribution reported in table is typical. Maryland and Virginia, North Carolina, Georgia, Florida, and Louisiana are the most important producers, normally accounting for 85 to 90 percent of the total catch. The seven other states account for the remaining 10 to 15 percent.

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Production of picked meat bears little relation to the catch of hard crabs in any given state. This lack of close correlation exists partly because in some cities--such as New Orleans, Baltimore, and Washington--hard crabs sold whole are very popular. Also, the differences in apparent yield of picked meat from the catch of hard crabs result from the fact that several states--for example, South Carolina, Virginia, New Jersey, and Delaware--ship some or most of their crabs to plants in neighboring states, where the meat is picked. Maryland is the most notable importer of live crabs; but Georgia, Mississippi, and Florida also import appreciable amounts and therefore produce more picked meat than their share of the catch would lead one to expect.

Production of Hard Crabs and Picked Meat, 1961					
Rank	State	Production			
		Hard Crabs		Picked Meat	
		Million Pounds	Percentage of Total	Million Pounds	Percentage of Total
1	Virginia	44.0	29.8	3.95	23.3
2	Maryland	26.7	18.0	4.98	29.4
3	Florida W. Coast	17.1	11.6	2.07	12.2
4	North Carolina	15.9	10.8	1.86	11.0
5	Georgia	12.3	8.3	1.44	8.5
6	Louisiana	11.9	8.1	0.48	2.8
7	Florida E. Coast	7.5	5.1	1.19	7.0
8	South Carolina	4.7	3.2	0.21	1.2
9	Texas	2.9	2.0	0.35	2.1
10	Mississippi	2.5	1.7	0.34	2.0
11	Alabama	0.8	0.5	0.08	0.5
12	Delaware	0.8	0.5	None	-
13	New Jersey	0.6	0.4	"	-
Total . . . . .		147.7	100	16.95	100

### PROBLEM OF CAPTURE

The catch of hard crabs has declined each year since the 1960 peak of 149 million pounds. Undoubtedly the normal, and still largely unexplained, variation in the population available to the crab fisherman is the cause of part of this decline. A recent survey (Lee, Knobl, and Deady 1963a), however, brought out other causes. Catching methods have changed hardly at all in decades, and exploratory studies are needed to investigate crab populations in deeper waters and in other areas not now being fished.

### PROBLEM OF MARKETING

Blue crabs are marketed as whole hard crabs, live, or steamed; as soft crabs; and as picked crab meat. Most of the crab meat is marketed fresh, but some is canned, and increasing amounts are being pasteurized. Frozen crab-speciality products such as deviled crab, crab cakes, and crab creole are also increasing in popularity.



Fig. 1 - Live crabs are a popular item in the famous French Market in New Orleans. The proprietor knows that blue crabs have a belligerent disposition and uses long tongs as the safest way to handle them.



Fig. 2 - Cans of freshly picked crab meat are nested in ice along with catfish and other Southern delicacies in this French Market stall.

Pasteurization, a process in which the hermetically-sealed crab meat is heated to about 170° F. and held at that temperature for a short time, enables the packer to keep his product in refrigerated storage for several months. Pasteurized crab meat, when properly processed and stored, retains the flavor and texture of the fresh product. A trend to an in-

crease in the production of pasteurized meat and frozen specialty products has been in evidence over the past decade, for the industry has shared in the increasing popularity of convenience foods.

Considerable quantities of crab meat are used in the frozen specialty products previously mentioned. Production of those items in 1961 amounted to 7.0 million pounds valued at \$7.4 million.

Canned blue crab, although second in value to frozen specialty items, is a popular product in inland areas. The value of the 1961 pack of canned meat (all styles) amounted to about \$860,000.

Marketing methods have remained relatively the same over many years. Except for the Philadelphia and New York areas, the distribution of fresh crab meat is still largely limited to the coastal states where crabs are caught. Despite progress in developing new market forms such as pasteurized meat and frozen specialties, there is much yet to be done in that direction, for a considerable amount of fresh crab meat is lost each season because of spoilage or is sold at prices too low to pay the cost of production. Finding a solution to the problems of marketing will greatly benefit the industry (Lee et al. 1964).

### PROBLEM OF PRODUCTION

In September 1961, the Department of Labor included crab pickers under a revision of the Fair Labor Standards Act. That Act requires that laborers be paid a minimum wage of \$1 an hour, which is to be raised, in two steps, to \$1.25 an hour by September 1965.

Historically, blue crab meat has been picked by hand, and the pickers have been paid on the basis of the amount they could produce. At the piece-work rate, however, many workers did not earn the minimum wage of \$1 an hour, and very few earned the \$1.25 hourly rate that will eventually be required by law.

SURVEY: In 1961, Congress appropriated funds for developing means to save the blue crab industry from the financial difficulties that its members felt would result from the new wage regulations. A research and development firm (The American Scientific Corporation of Alexandria, Va.) has been working under contract on the problem since October of that year.

The first step in the contractor's investigation was to survey the industry (Lee, Knobl, and Deady 1963a). As is evident from figure 3 (prepared by the contractor), blue crab plants are widely distributed along almost 2,000 miles of coastline in over 100 locations. The plants vary greatly in size, employing from 3 to more than 75 pickers, and vary also in the ways in which crabs are handled. In the multiple-flow sheet (fig. 4, developed from information collected during the aforementioned survey), the 15 vertical series of dots represent different sequences of handling in which the 28 possible suboperations--between the arrival of the live crabs at the receiving end of the plant and the movement of the final product from the shipping room--were observed in one or more of the plants surveyed.

PROGRESS TOWARDS SOLUTION: The factors of location, difference in size, type of operation, and economic condition of the individual firms greatly complicate the problems involved in providing some measure of economic relief. After the contractor made his survey, he concluded that several relatively inexpensive machines that could be used either independently or in combination would provide the flexibility in level of mechanization that the industry requires. Initially, however, because of the time required to develop machines of this type, the contractor suggested that a higher rate of production might be obtained through maximum utilization of the workers' skills. A plan for providing the industry some measure of immediate economic relief through worker specialization was discussed in a second report of the contractor's studies (Lee, Knobl, Abernethy, and Deady, 1963b).

At the present time, the contractor is working on the first of the proposed machines. This will, when perfected, clean the crab core and prepare it for extraction of the lump meat.

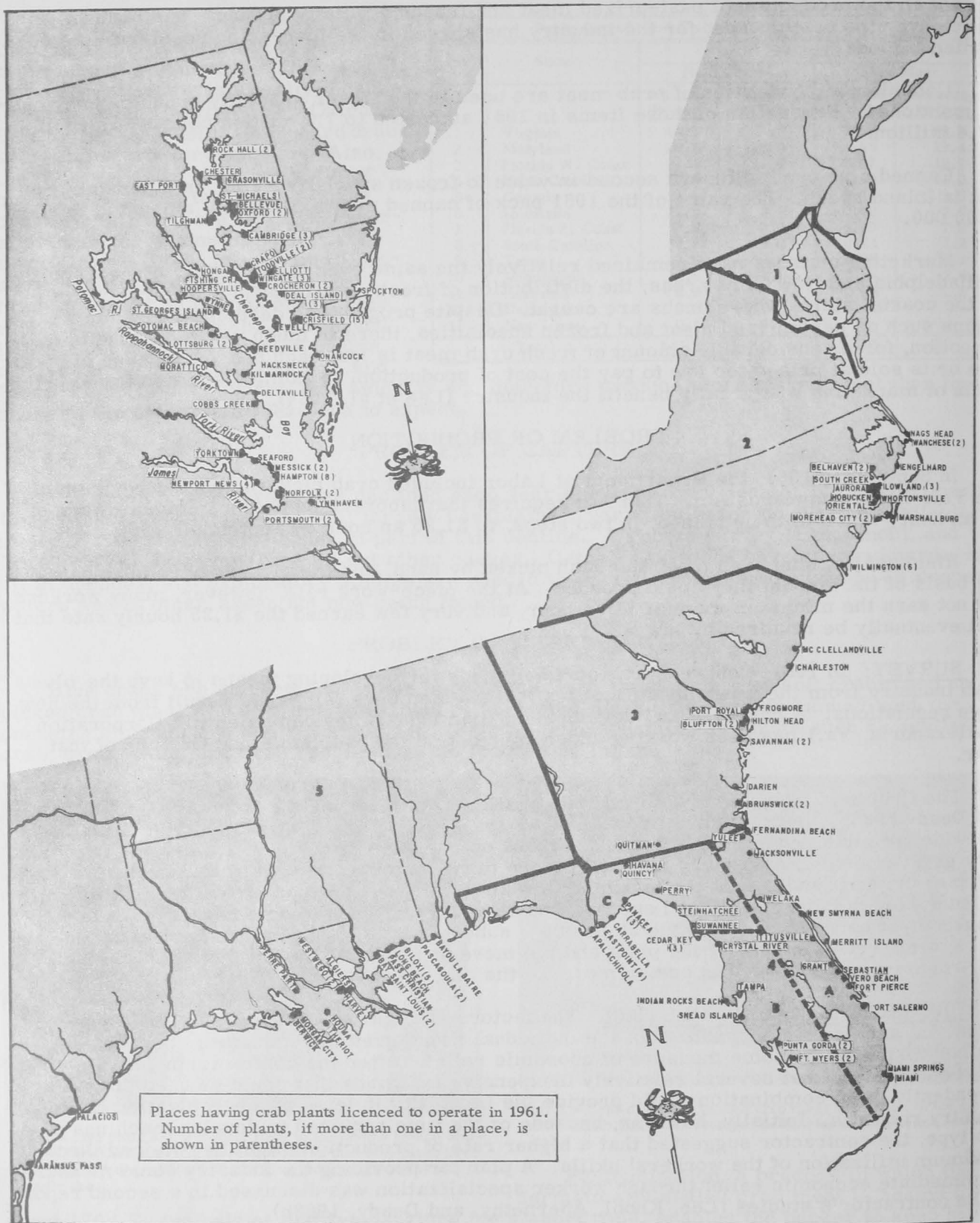


Fig. 3 - Crab-plant locations. The blue crab meat pack of the 1961 season was processed in over 170 plants scattered widely along the coastline from Upper Chesapeake Bay to Central Texas. Plants differed greatly in size and, as shown, were mostly located in or near small towns. Among the 106 plant sites shown are tiny fishing villages such as Frogmore, Deal Island, Toddville, Honga, and Fishing Creek. This scattered pattern of production greatly complicates the successful mechanization needed to restore the industry's economic well being.

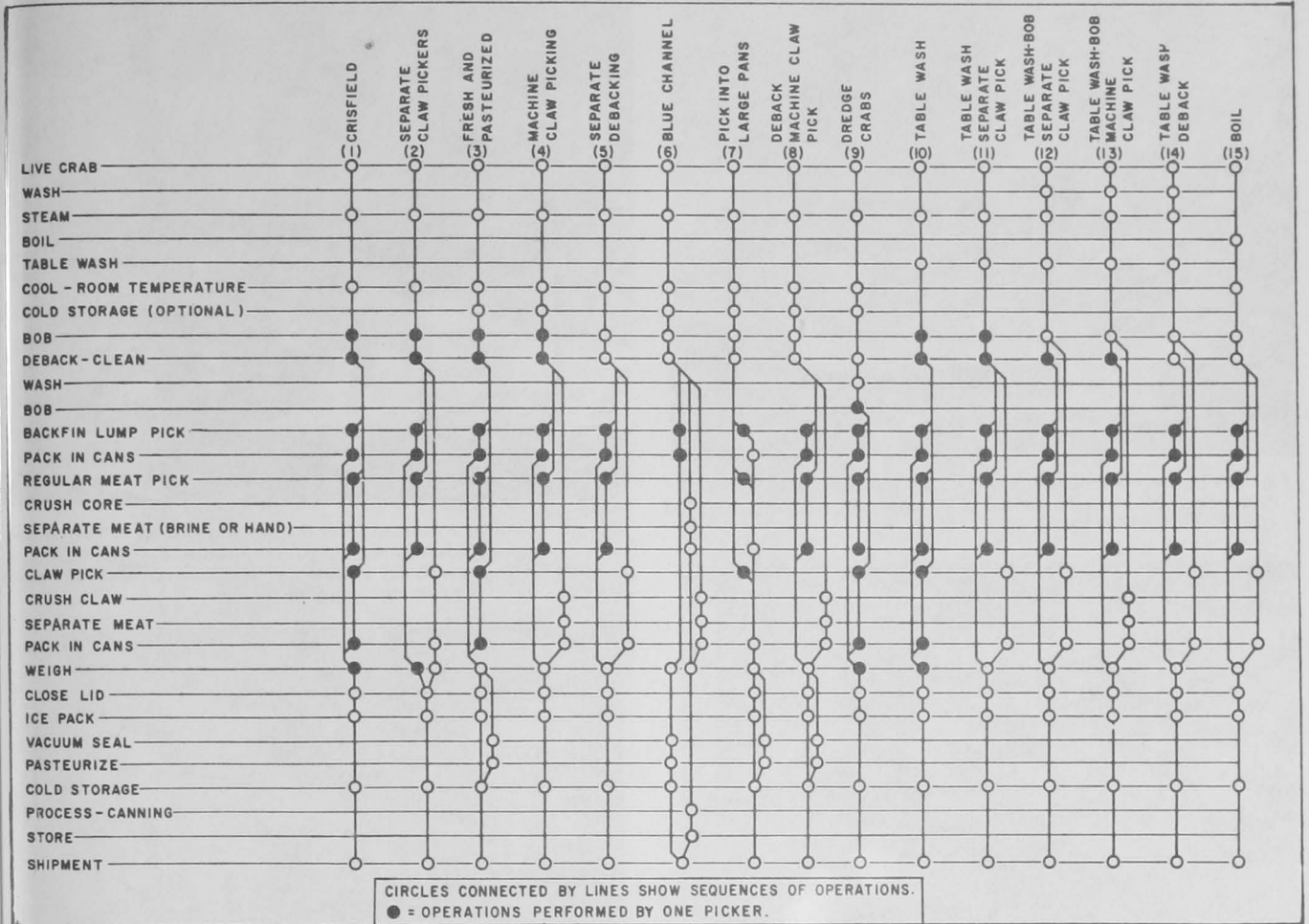


Fig. 4 - Various operation sequences. This chart, developed after a survey of the blue crab industry to determine the degree of mechanization needed, shows the 15 distinct and different handling patterns of 28 possible steps between live crabs and shipped meat that were observed in 65 plants studied.

The lump meat then can be removed manually or by a second machine that can be attached to the core-preparing device. A model of the lump picker has been fabricated and successfully tested.

To ascertain the production problems and the role that the machines now being designed may play, you will find it helpful to quickly view the industry by means of figures 5-40. The photographs were taken in 1960, the year just prior to the one in which the Fair Labor Standards Act went into effect. Although some of the plants have now shut down and a few others

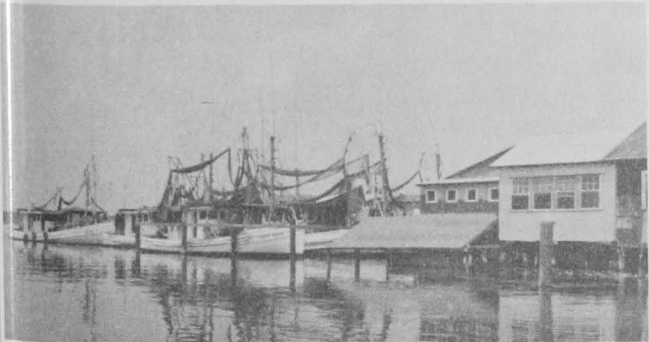


Fig. 5 - Shown is a crab plant in Mississippi on Biloxi Bay. With few exceptions, crab plants are located on the waterfront.

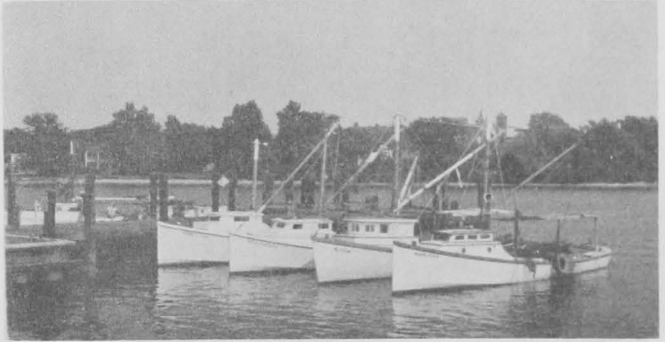


Fig. 6 - Some of the crab boats of lower Chesapeake Bay are relatively large. In most areas, however, crab fishing is a small-boat operation.



Fig. 7 - In the foreground are two of the more common types of crab boat. Many crabs are fished by one man in a boat powered with an outboard motor.



Fig. 8 - Crabs are hoisted from the boat in baskets or barrels and weighed. Crab fishermen are paid on the basis of the weight of catch. Most "crabbers" are independent, though they often have agreements to supply certain plants.



Fig. 9 - Although most plants are located on the waterfront, many of the larger plants truck crabs from other areas, sometimes hundreds of miles away, to supplement local production and to maintain a regular supply.



Fig. 10 - This plant uses circular retort baskets in which the crabs are cooked. Each basket holds 300 to 400 pounds of crabs.

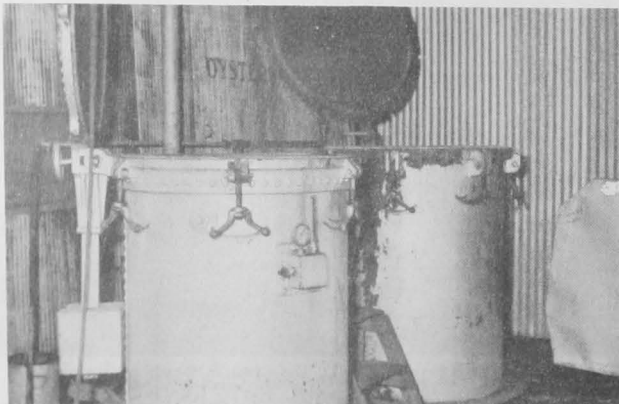


Fig. 11 - Vertical retorts for cooking the crabs are used in most crab plants.



Fig. 12 - Other plants use horizontal pressure cookers. This cooker holds 4 of the wheeled steel mesh carts.

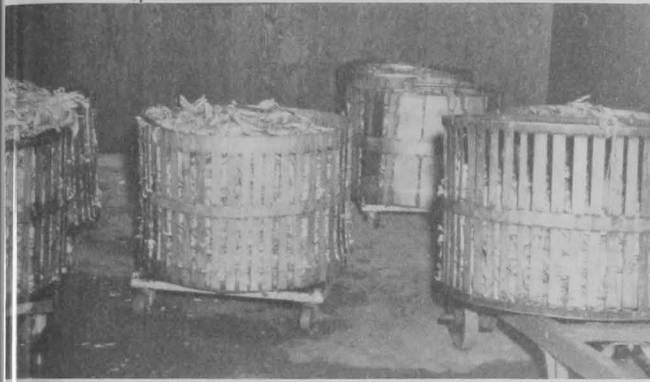


Fig. 13 - Cooked crabs are handled in many ways. Some Chesapeake Bay plants hold the baskets of crabs in a cooler overnight.



Fig. 14 - Many Gulf Coast plants deback the crabs as soon as they are cool. Here a hoist is lifting a basket until it can be tipped to dump the crabs onto the debacking table.



Fig. 15 - These workers are debacking or "bobbing" crabs. Claws are removed at the same time, as they are picked separately. The shell and viscera are discarded. Since the yield of crab meat amounts to only 12 to 15 percent of the weight of whole crab, disposing of the waste is a problem.



Fig. 16 - Many of the larger plants solve the problem of waste disposal by converting the waste into a salable product by use of a crab-scrap dryer. Waste from the debacking operation and the picking tables is dumped into the big hopper (foreground) and carried into the rotary dryer by means of a screw conveyor.



Fig. 17 - At the discharge end of another dryer, a worker is checking the scrap to determine if it is sufficiently dry for grinding.

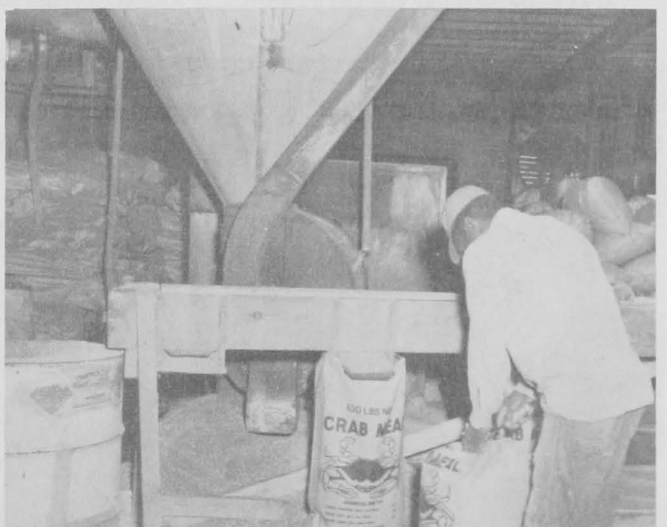


Fig. 18 - The scrap goes from the dryer to a hammermill, where it is ground to meal and bagged. The product is used in mixed feeds for chickens.



Fig. 19 - Returning to the main plant, we see debacked crabs being washed in flowing water.

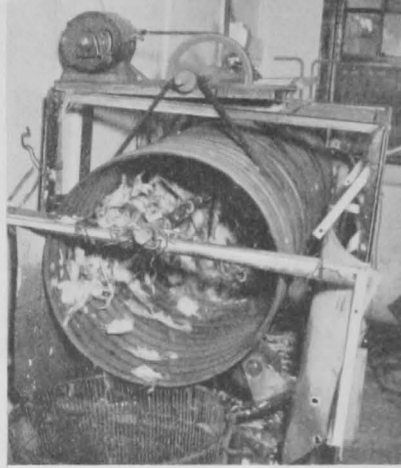


Fig. 20 - Some plants use rotary washer, for cleaning the debacked crabs.



Fig. 21 - This is a different type of rotary washer, used only for claws.



Fig. 22 - Here the debacked "cores" are washed by water sprays in an elevated flume and are transported to a basket at the end of the debacking table.



Fig. 23 - This is a crab-picking room after the daily cleanup. The cans are for the disposal of waste. In the Chesapeake Bay Area, crabs are usually cooked in the afternoon and cooled overnight. Pickers start work about daybreak.



Fig. 24 - Pickers work from baskets of crabs in this plant.



Fig. 25 - Picking blue crab is almost entirely a hand operation and requires a large force of skilled workers.





Fig. 26 - The cartilage is cut and the meat picked out with a special knife.



Fig. 27 - These pickers are working on claws, which are picked separately, since the technique is quite different from that for picking body meat.



Fig. 28 - This is a patented crab-picking machine sometimes known as a claw cracker. The screw-conveyor elevates the claws to the hopper of a special type of hammermill. The broken pieces fall into a separation tank from which the meat floats off to an inspection-conveyor belt at the left. A U.S. Department of the Interior fishery inspector is observing the operation.

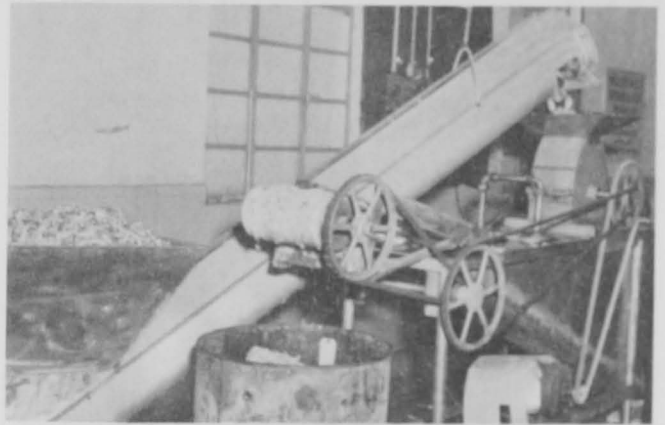


Fig. 29 - The shell fragments sink and are carried from the bottom of the tank by a conveyor belt, center foreground, from which they fall into a waste barrel. At left is the hopper heaped with crab claws feeding the screw-conveyor to the mill.



Fig. 30 - Workers check the machine-picked meat for residual shell. Note the gallon cans for packing. The product packed in gallon cans rarely reaches the retail market--it is used in mixtures such as deviled crab and crab cakes.



Fig. 31 - At the packing-room delivery window, the picker at left is bringing her pan of cans for credit. The pans in the foreground contain lids for three types of meat. Different production areas use a variety of descriptive names for the various grades or types of pack: backfin, special, white flake, regular, all lump, and so on. Basically, the types differ in the proportion the can contains of the large lump meat from the backfin.



Fig. 32 - This plant uses wheeled bins to ice and hold the packed meat after the weight has been checked and the cans capped.



Fig. 33 - Wooden barrels are commonly used to ship the fresh crab meat, well packed in ice.

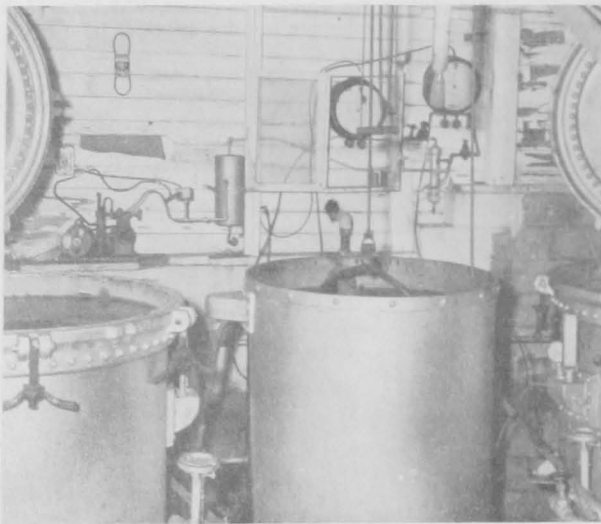


Fig. 34 - A sizable proportion of freshly picked crab meat is pasteurized and, for this process, must be packed in hermetically sealed cans. The sealed cans are placed in a steel autoclave basket and lowered into the open cooking tank. Gauges on the rear wall record the cooking time and temperature.

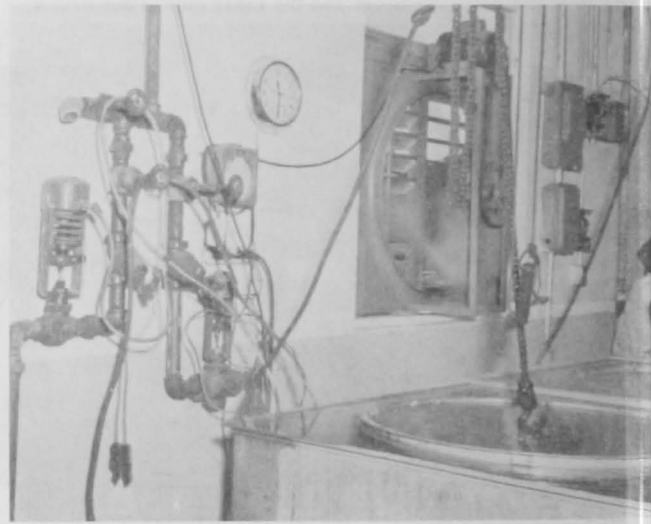


Fig. 35 - Time and temperature used in pasteurization must be carefully controlled to obtain desired keeping qualities without overcooking.



Fig. 36 - Open tanks can be used, since pasteurization temperatures are below boiling. Tanks in background are used to cool the cans of pasteurized meat.



Fig. 37 - The natural shell used by many producers of deviled crab comes from the regular picking operations. After being cleaned, the shells are laid on a table in the sun to dry.

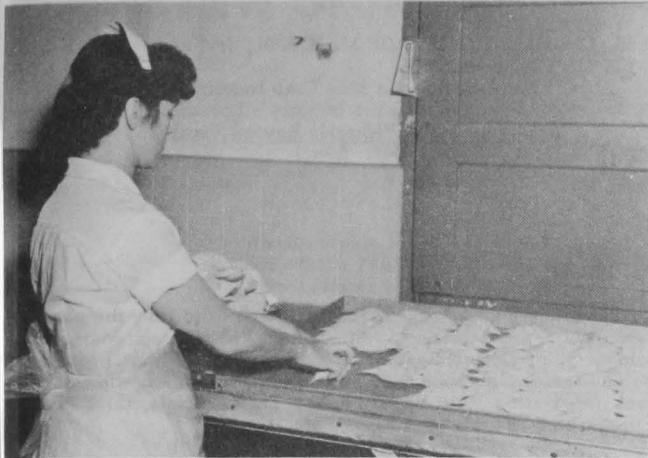


Fig. 38 - Frozen "specialty products" containing crab meat are rapidly gaining in popularity. In the preparation of deviled crab, the crab mixture is molded into the natural shell and frozen before breading and packaging. This worker is removing the frozen crab product from the freezer tray.



Fig. 39 - The frozen shell-with-deviled-crab-mix is hand dipped in batter and breading and then is packed into boxes.



Fig. 40 - The institutional size box holds 12 to 18 crabs. Packing the crab in the natural shell results in an attractive product.

have made changes to increase efficiency of operation, this series of photographs is still quite typical of the industry in the early months of 1964.

Figure 41 shows the cleaning-debacking, core-preparing machine with guards, delivery, and discharge chutes removed so that the working mechanism is open to view. The contractor has expressed his belief that this machine, combined with the lump picker previously mentioned, will enable every plant to operate profitably even with a \$1.25 hourly wage minimum.

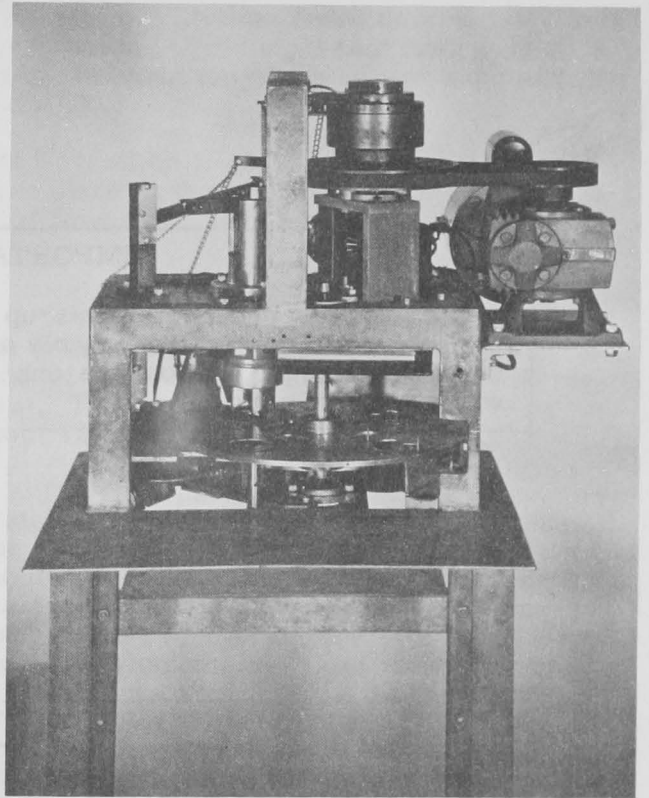


Fig. 41 - This small machine developed for the blue crab industry under contract with a research and development company will, when perfected, take whole cooked crabs and prepare cleaned cores ready for removal of lump meat at the rate of about 1 per second. The guards and the delivery and discharge chutes have been removed so that the working mechanism is open to view.

mentioned, will enable every plant to operate profitably even with a \$1.25 hourly wage minimum.

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## IMPORTANT NOTICE

Due to an unexpected mix-up in the mailing of the June 1964 issue of the magazine, there are probably a number of subscribers who did not receive that issue. If you are one of those who did not receive that issue, write us for a copy.

Created in 1849, the Department of the Interior—a department of conservation—is concerned with the management, conservation, and development of the Nation's water, fish, wildlife, mineral, forest, and park and recreational resources. It also has major responsibilities for Indian and Territorial affairs.

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