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MECHANIZING THE BLUE CRAB INDUSTRY

Part II - Measures for Immediate Relief Through Worker Specialization

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ABSTRACT

This article suggests how the efficiency of the picking operation in the blue crab industry can be improved (1) by utilizing each worker's skill maximally, (2) by choosing the workers for teams according to their skill in each special operation--cleaning, lump picking, and flake picking--so that the work output of the team members is balanced, and (3) by improving the method of material transport among workers.

SUMMARY

Suggestions have been made for ways in which the efficiency of blue crab picking plants can be improved. The fundamental alteration involves assignment of workers to specific duties in which their individual abilities are fully utilized. For maximum efficiency, it is necessary to balance the system whether it be a small work team of 3 or 4 members or a team several times as large. An excess or deficiency of crab parts at any worker station should be avoided. In general, owing to the different rates at which each operation--cleaning, lump picking, and flake picking--can be done, the desired balance is easiest to obtain when the team is composed of several times more than the minimum number of workers required. With suitable arrangement of the team units and use of chutes to move material for small groups or of trays and a gravity roller-conveyor system to move material for large groups, material being handled can move freely through the system without the loss in time that is involved in hand-carrying from one place to another.

With these relatively simple and inexpensive modifications of present practice, the contractor believes that most crab plants can operate at a profit even when all workers are paid the minimum wage required under the amended Fair Labor Standards Act.

BACKGROUND

The blue crab industry employs a large number of workers to pick the meat of cooked crabs by hand. Prior to September 1961, these pickers had been paid on the basis of the amount of meat they produced. Since that time, an amendment to the Fair Labor Standards Act has required crab pickers to be paid a minimum hourly wage. In mid-1961, Congress recognized the problem that this regulation would create for the crab industry and provided the U. S. Bureau of Commercial Fisheries with funds to help the industry through mechanization of the hand operations.

To investigate the problem of mechanization, the Bureau employed a contractor (1) to survey the blue crab industry to determine its exact requirements in regard to mechanization, (2) to suggest the machines needed, and (3) to develop specific recommendations for increasing the efficiency of the present industry, thereby enabling the plants to operate at a profit during the interim period before the machines become available. The purpose of this,

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the second article in the present series discussing the contractor's findings, is to report his recommendations for increasing the efficiency of present plant practice.

The main topics discussed in this report are (1) the basic principle underlying the contractor's recommendations, (2) the grouping of workers into teams, and (3) the contractor's operational suggestions.

BASIC PRINCIPLE

The principle on which the contractor based his recommendations for increasing the efficiency of the picking operation (which is the operation requiring most of the hand labor in the industry) was, in a word, "specialization." His team of engineers made intensive observations of a group of pickers in a typical Maryland plant and then, on the basis of these observations, developed a plan for modifying the picking procedure. Before recommending their proposed plan, however, the engineers tested its workability in a second plant.

The basic principle of their recommended plan was to assign the individual worker to a special task that observations and trials demonstrated he had the ability to perform with above-average speed or skill. One worker may, for example, pick crab claws more rapidly than another worker, who is perhaps rather slow but who, by virtue of his greater care, might do an excellent job of separating the relatively high-priced lump meat in large pieces and with maximum yield. In short, the essence of the plan is that through observations or time trials, each plant manager groups his workers according to their individual abilities.

TEAM FORMATION

The next step is to select groups of workers to form teams to perform the three fundamental operations of (1) cleaning, (2) lump picking, and (3) flake-meat picking. The primary consideration in making up the teams is to achieve balance among the workers assigned to each operation. Ideally, work should flow smoothly between operators, with minimum accumulation of crab parts at any one point, but with an adequate supply of crab parts to keep all operators busy.

The following discussion of the duties of each job may be helpful in the selection of workers:

1. The "cleaner" removes the back and legs of the crabs and scrapes the body core to remove the unwanted parts (gills and viscera, etc.). This job requires moderate speed and the ability to cull out crabs of poor quality.

2. The "lump picker" makes two back slice cuts and extracts the lump meat. This job needs maximum care, precision, and dexterity, rather than speed, since lump meat is a premium-priced product; both maximum size of lump and maximum yield must be obtained.

3. The "flake (residual body meat) picker" takes out all the remaining meat from the back slices and body. This worker needs above-average speed combined with the ability to work cleanly and to extract the maximum amount of this residual meat consistent with fairly rapid handling.

OPERATIONAL SUGGESTIONS

In practice, perfectly balanced teams consisting of one worker for each task are difficult to obtain. Moreover, some workers, after short periods on special jobs, increase their productive capacity considerably, whereas others may already have been working near their maximum rates. In order to obtain the desired balance, the individual workers may be reassigned, or the size of a group may be increased. In the determination of the size and make-up of the group, economic factors such as the price and supply of crab must be considered. Also to be considered in the effort to achieve maximum plant efficiency is the method of transporting the raw and the processed material through the system. In the following discussion, these topics are considered in more detail.

WORKER ASSIGNMENT: A cleaner may work too fast for the other team members and, if so, should be shifted to a faster group for maximum efficiency. Flexibility should be maintained, especially in the first weeks after the new system is installed. The operation of the groups should be closely observed.

GROUP SIZE: During plant trials with selected worker teams, the contractor found that owing to the different times required for each operation, it was difficult to obtain the desired system balance with picker teams composed of only 3 or 4 members. Although it may be assumed that more evenly balanced teams would be obtained after observation of worker skills over a longer period and through shifts between groups after the skill of each worker became better known, the use of large groups does offer advantages. With four or more workers on each specialized operation, there is a considerably greater chance of being able to compensate for the difference in time required for each operation.

In the plant under study, the average time required for pickers to perform each step per crab was as follows:

1. Debacking-cleaning, 7.9 seconds.
2. Cutting back slices and removing lump meat, 6.2 seconds.
3. Picking two back slices and core, 16.5 seconds.
4. Picking two claws, 15.3 seconds.

In actuality, there was a wide variation in the rates at which individual pickers performed the operations; for practical purposes, the "average" worker does not exist. These data

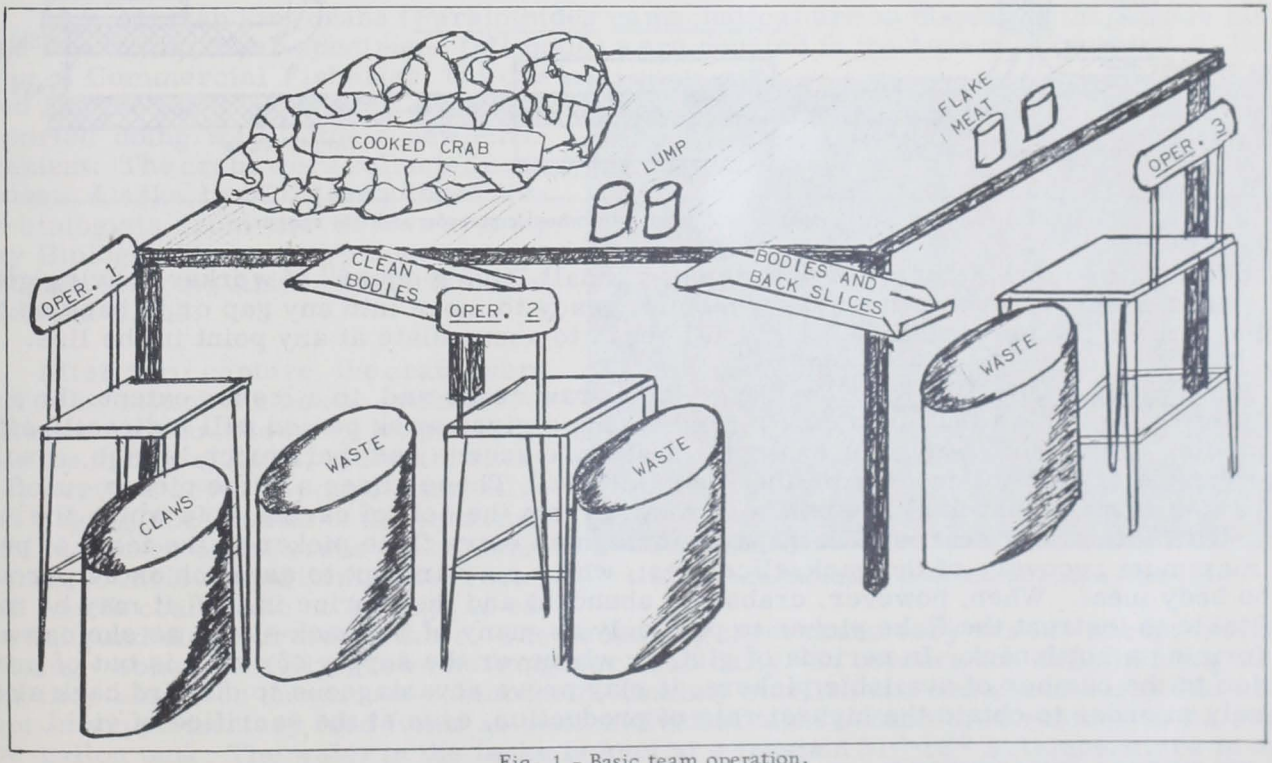

Fig. 1 - Basic team operation.
Operator 1, removes and saves claws, pulls off back and legs, scrapes out body cavity, culls out poor quality crabs; needs moderate speed and good judgment of condition of crabs.
Operator 2, makes two back slices and removes lump meat; needs care and dexterity to get maximum yield of large-sized lump.
Operator 3, removes the flake meat from body and back slices; needs above-average speed and dexerity to salvage maximum amount of residual body meat.
Note: Operator 2 may pick some back slices, or a fourth operator may be used to the right of Operator 2, to assist with the final step. Claws are picked as a separate operation.

serve only to emphasize that team operations are not readily subjected to balancing with a simple 3- or 4-member team. By increasing team size, balance can be obtained with increasing simplicity, limitations on group size being imposed chiefly by the problems of material transport. Four- to six-worker teams can operate at one table by adaptations of the principle illustrated in figure 1. For large plants, groups of 4 to 10 specialists may be profitably concentrated in a single work area with some type of mechanical transport of material between work areas (fig. 2). A larger group also has the advantage that supervision of the operation is simplified, reducing management problems.

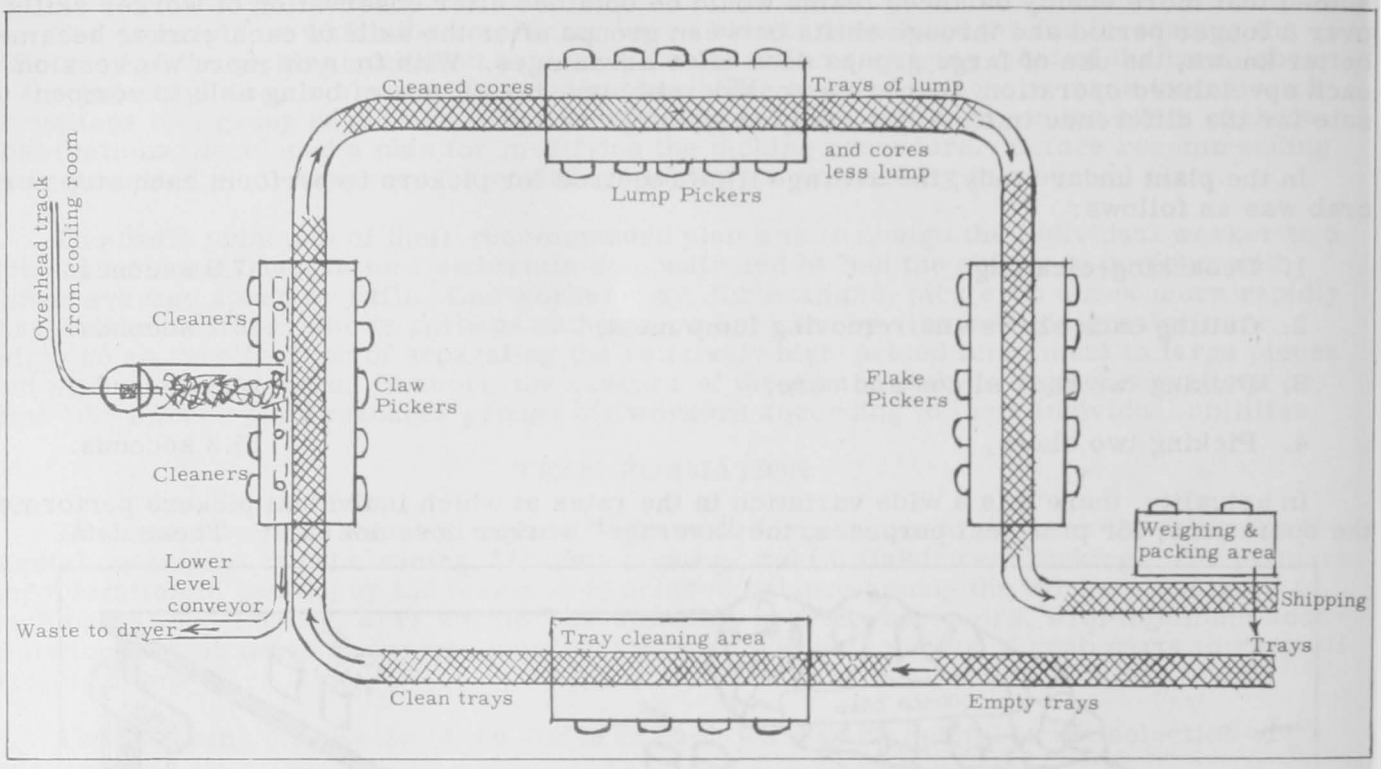

Fig. 2 - Large group operation using gravity wheel conveyors and tray system.

With one or more balanced large teams, a small "flying squad" of workers having general skills could be developed and kept mobile, ready to move into any gap or to back up the regular crew if, for some reason, material began to accumulate at any point in the line.

ECONOMIC CONSIDERATION: The price of raw crabs and, to a lesser extent, the amount of cooked crabs that should be picked during a given work period will indirectly affect the picking operation. When, for example, crabs are scarce and their price is high, it will be profitable to pick the meat from the "back slices." These slices are the pieces cut off by the lump picker so that the lump can be removed from the cell of cartilage in which the lump lies. When crabs are scarce, it may pay to assign an extra flake picker to the team to permit maximum recovery of the back-slice meat, which may amount to as much as 24 percent of the body meat. When, however, crabs are abundant and their price is low, it may be more profitable to instruct the flake picker to pick only as many of the back slices as she can without forming a bottleneck. In periods of glut, or whenever the supply of crabs is out of proportion to the number of available pickers, it may prove advantageous to discard back slices entirely in order to obtain the highest rate of production, even at the sacrifice of yield.

MATERIAL TRANSPORT: For teams composed of 3 or 4 workers, it is convenient to work on two sides of a rectangular table from a pile of cooked crabs in front of the cleaner (fig. 1). A chute on the edge of the table can be used to carry the cleaned cores to the lump picker on the cleaner's right, and a second chute can be used to carry the back slices and bodies, minus lump, to the 1 or 2 flake pickers at the end of the table.

With larger groups, it may be practical to install a gravity-wheel conveyor system to carry the material from one group of specialized workers to another, as illustrated in figure 2. At one end of the rectangular work area the cleaners sit at a table, and conveniently located on the opposite side of the table sit the claw pickers. The conveyor carries the pans of cleaned crab cores around the corner to the lump pickers. The back slices and partially picked cores move in trays by conveyor to the larger group of flake pickers. Just beyond this point, the trays of cans, or pans of picked meat, move on a take-off conveyor into the packing area, where the weights of the cans are checked and the cans are capped and iced for shipment or storage (or alternatively, are pasteurized). The now empty trays are returned via the conveyor to a tray-cleaning area. From this point, the clean trays complete the circuit back to the cleaners' table. An under-the-table conveyor system can also be used to remove the waste. An installation of this type can operate efficiently when the number of workers in the group range from 20-40 or more.

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Note: Part III - Strengthening the Industry's Economic Position, will appear in a later issue of the Review.

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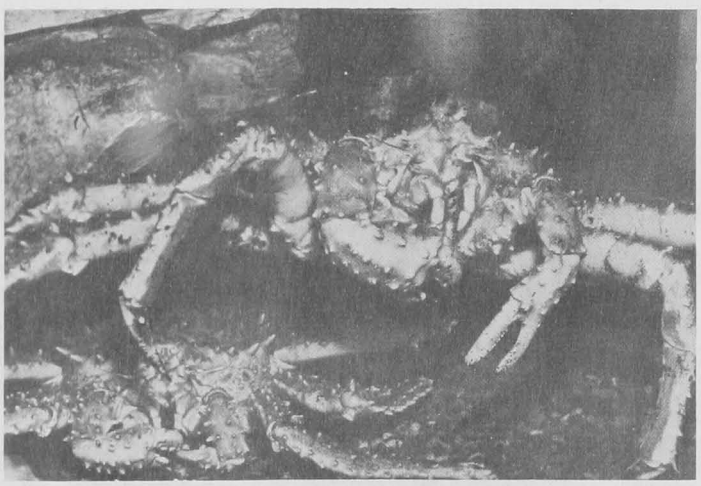
LIVE ALASKAN KING CRABS ON DISPLAY AT SEATTLE MARINE AQUARIUM

In reporting on the donation of live Alaskan king crabs to the Philadelphia Aquarama in April 1963 (Commercial Fisheries Review, May 1963 p. 15), no mention was made of those on display at the Seattle Marine Aquarium. The Curator of that Aquarium called this oversight to our attention and supplied the following information.

Live Alaskan king crabs (Paralothides camachatica) are on display at the Seattle Marine Aquarium. Four specimens (all male) were donated to the Aquarium by the U. S. Bureau of Commercial Fisheries, but one died and the three remaining crabs are reported doing well in their new environment. The crabs were collected near Juneau, Alaska, by SCUBA-equipped diver-biologists from the Bureau's Auke Bay Biological Laboratory under a permit issued by the Alaska Department of Fish and Game.



Live king crabs on display at the Seattle Marine Aquarium.

After their capture, the crabs were placed in styrofoam boxes packed with snow and kelp and flown by jet plane, about the middle of April, to Seattle where they arrived several hours later alive and kicking. The Curator of the Aquarium said that three of the crabs took immediately to various food items given them. The fourth crab made no attempt to eat anything and died four weeks later. The remaining three crabs very readily accept frozen herring--about one fully-grown herring per crab daily. In between the daily herring ration they also feed on various echinoderms (mainly starfish and sea cucumbers) that are kept as supplementary food items in their individual tanks. Each crab resides in its own 400-gallon tank. The water in the tanks is kept at a constant 51°-52° F. temperature in an open-circulating water system.

The live Alaskan king crabs now in captivity in the United States total nine. Besides the three at the Seattle Marine Aquarium, the others are on display at the New York Zoological Society's Aquarium in New York City and the Philadelphia Aquarama.