THE SEPARATION OF CRAB MEAT FROM SHELL & TENDON BY A CENTRIFUGAL PROCESS

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In a laboratory study of improved methods for removing shell fragments and tendon from hand-picked Dungeness crab meat, researchers at the Seattle Fishery Products Technology Laboratory examined the application of centrifugal force to the problem. Trials with an industrial, solid-bowl centrifuge indicated that a machine of this type had great potential for the separation of meat from shell.

The centrifuge, a Bird Machine Co.* solid-bowl machine, designed primarily for the classification and separation of materials like gravel, had a rated capacity of 0.7 cubic foot of solids per minute and required a 30 hp motor to overcome the starting inertia. The unit required 15 hp for normal operation after starting.

In these studies, the machine (Figure) was fed with chopped crab or crab shell in a saturated brine slurry. The separated meat was screened from the brine as it left the centrifuge. The brine was recirculated at rates up to 15 gallons per minute.

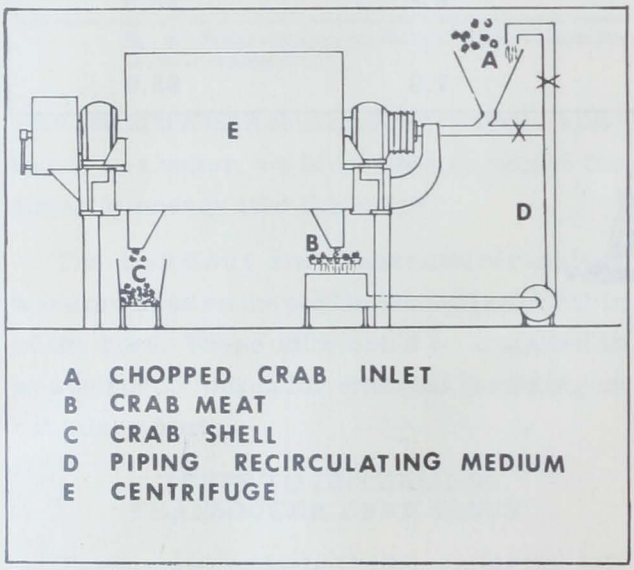

Diagram of centrifugal process for separation of crab meat from shell.

Separation of Picked Meat from Shell & Tendon

The centrifuge was first tried with fresh, commercially picked Dungeness crab meat obtained from the "shaking" table. This meat contained pieces of shell and tendon that are removed by brine flotation in normal plant practice. The material was slowly added to the hopper from which it was carried by saturated brine at approximately 12 gpm into the bowl that rotated at 2,000 rpm. Within 2 or 3 seconds, pieces of meat appeared in the effluent. Pieces of shell and tendon were thrown from the solids discharge end of the centrifuge. Little or no meat was carried over with the shell or tendon and, aside from the pieces of tendon that were attached to meat, no shell or tendon remained in the meat. If pieces of gill were mixed with the meat, they remained with the meat during centrifugation. Usually, pieces of gill are removed at the time of butchering. Although the recovered meat was shredded and excessively salty to taste, the first trials showed that it is feasible to separate crab meat from crab shell by means of a centrifuge.

Recovery of Meat from Crab Shell Scrap

Dungeness crab shell scrap (the shell remaining after the removal of meat by hand) was chopped into pieces ranging in size from about $\frac{1}{8}$ to $\frac{1}{2}$ inch and fed into the hopper in saturated brine. The centrifuge separated the slurry into meat-free shell and shell-free meat. In three different lots of scrap used, the meat recovered ranged from 14 to 20 percent of the weight of the scrap. This is roughly equal to 15 percent of the weight of the meat removed by hand picking.

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The meat from the shell scrap was of small particle size, perhaps in part because of chopping. However, it was darker in color and flakier than the pieces of muscle described in the previous section. This meat could be valuable alone, but it appeared to us that its greatest value was as an ingredient for blending with larger, more fibrous pieces of meat for use in manufactured products such as crab cakes.

An example of recovery of meat from scrap in a "typical" Dungeness crab plant might be useful in pointing out the potential significance of this procedure. If we assume a plant with 20 pickers or shakers, each of whom produces 100 pounds of meat an hour for six hours per day, the total shell scrap produced per day is approximately 12,000 pounds. Using a realistic figure of 15 percent yield of meat from the scrap, it is clear that about 1,800 pounds of meat are recoverable. Assuming further that the quality of the recovered meat is such as to yield a return only half that of easily shaken meat, using May 1971 prices for Dungeness crab meat, the 12,000 pounds of scrap shell produced daily contains recoverable meat worth about $1,400.

Centrifugal Recovery of Edible Meat from Other Crab Species

In separate experiments, Dungeness crab body and leg sections, blue crab claws, and snow crab legs and bodies were chopped and then fed into the centrifuge in a saturated salt solution slurry. In all cases, the meat was free from shell and tendon, and the shell was free from meat. As was the case in other tests, the meat was shredded and more salty than desirable. Yield data were not obtained for Dungeness crab. Yields from blue crab claws and snow crab legs and snow crab body sections are shown in table.

Yield of meat obtained by centrifugal treatment of blue crab claws and snow crab body sections and legs

Source of meat	Yield of meat
	Percent by weight
Blue crab claws (cooked)	31
Snow crab bodies (cooked)	52
Snow crab legs (cooked)	29

Recent Developments

Since the completion of the work reported here, a centrifuge designed specifically for the separation of crab meat from shell and tendon has been designed and constructed. This machine is being tested at the Fishery Products Technology Laboratory at Gloucester, Massachusetts. The results of early tests are highly favorable and show that the new centrifuge produces a considerably better product than that produced by the centrifuge used for tests carried out in Seattle.