

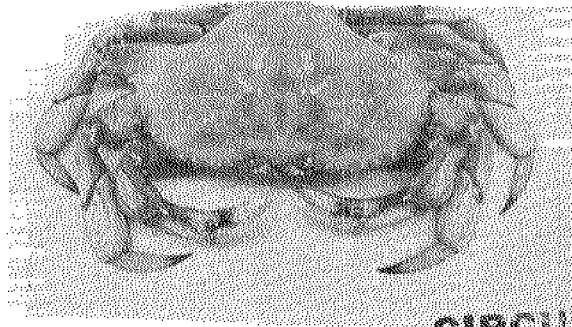
## DUNGENESS CRAB MEAT EXTRACTION

by

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and

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The procedures presented are not THE BEST WAY or THE ONLY METHOD of crab meat extraction, since some plants may have different process requirements. By following this method, however, you will find that it is easier to remove the meat from a crab, and that you will be able to pick more meat in a work day. You may also find that your work is less tiring. If you have never picked a crab before, this manual will illustrate the procedures and techniques that are necessary to pick a crab with a minimum amount of effort and fatigue while yielding a quality product. Should you be a veteran picker, the manual will give you something with which to compare your present picking method. Such a comparison will show whether you can improve your skill level and thus increase your value to your employer.

YOU CAN HELP!

With the aid of this manual, individual skill levels can be raised and overall plant averages increased. However, we need your comments as we continue our in-plant training tests. Your suggestions on other methods for crab meat extraction and means by which we can improve this "NEW METHOD" are most welcome.

The development of these training aides has largely been made possible by the cooperation and participation of the management and employees of numerous seafood processing plants. These contributions are greatly appreciated. The cooperation of the National Marine Fisheries Service, OSU's Marine Advisory Staff and other cooperating departments is also gratefully received.

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## PREFACE

This "NEW METHOD" was developed after studying motion pictures taken of low, average and highly skilled pickers. In-plant discussion sessions were also conducted with employees to get their ideas and reactions on various picking techniques and procedures. To test the value of this "NEW METHOD", an overall in-plant training program was established in an Oregon seafood processing plant.

The group used to test this method consisted of thirty-six women of various age, and with various degrees of experience in crab meat extraction. Every woman extracted the meat from all body parts of the crab, including the tip meat (manus). The testing was conducted over a sixty day period. (The women did not work every day during that period.) At the end of the testing period there was an average plant production increase of 20% over the previous year's rate. (Using only production records for employees involved in the test.) In addition, the average meat yield increased from 50 to 54 percent (this percentage is the amount of meat per total body weight recovered from a cooked-crab section.)\*

The relative increase in production and yield depends upon the existing skill level of the individual. Thus, some individuals will increase their production significantly and others only marginally. The test data of several women are listed below to illustrate representative findings.

Employee's Number	Previous Year's Ave. (lbs/hr)	Testing Year's Ave. (lbs/hr)	Testing Year's Daily Max. (lbs/hr)	Percent Increase
2	11.60	15.42	17.95	33
3	14.09	17.24	22.57	22
6	13.50	14.20	16.31	5
29	9.79	15.36	17.38	57
36	17.30	17.50	21.79	1

Note: Data for days on which "Boat Run" crab was processed was not included in these figures, hence, the average live-crab weights were less than two pounds. ("Boat Run" crab processing occurs when the larger crabs, usually sold whole, are hand picked along with the smaller crabs.)

\* A complete summary of the production records and yield increases appears in the Willis thesis. Paul Willis also describes in detail, direct and indirect skill factors, left and right-hand operation charts, and the individual and group reactions during and after his in-plant training sessions.

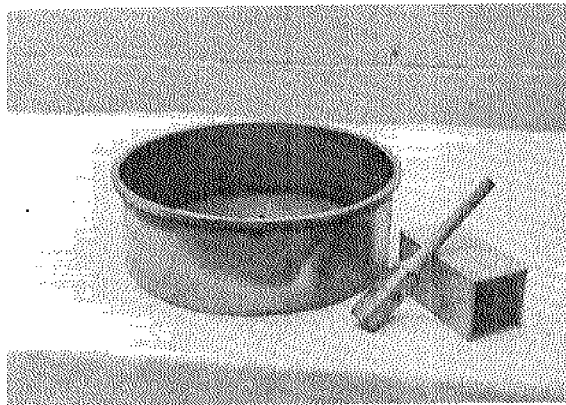
Paul Willis, "Skill Design Evaluation and Implementation of Improved Dungeness Crab-Meat Extraction Methods" (Thesis scheduled for completion, January 1973).

## EQUIPMENT AND WORK PLACE DESIGN

The worker must be provided with the proper equipment for efficient meat extraction. Rubber gloves are usually worn while picking. They should fit tightly and be as thin as possible for proper feel.

The meat pan should be built with a flat base so that it will not rock back and forth while it is being used as a hitting base. Any movement in the pan will require extra hits to remove the meat from the crab body part. The number of hits can be further reduced by using a heavy pan or placing a firm hitting edge next to the pan. When shallow pans are used, a larger pan or a deflector shield should be used. Such a shield will deflect flying meat back into the container.

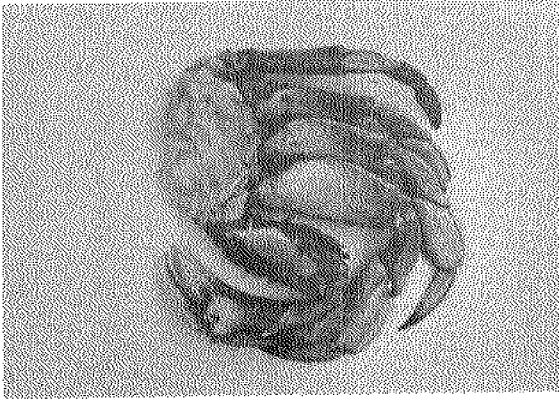
The hammer and anvil are required for leg picking. The hammer should be light, non-corrosive, and fit comfortably into the operator's hand. The anvil should be stable and non-corrosive. The top surface of the anvil should be about 3 inches from the table. This distance is required for the hand when placing crab body parts upon the anvil. The work place below illustrates the above mentioned characteristics.



### CRAB MEAT EXTRACTION WORK PLACE

Note the relative position of the equipment to the crab and the crab parts in the picture sequences on the following pages. The equipment should be as close to you as possible to minimize the distance traveled by your hands during meat extraction. Proper location of the crab and crab parts will enable you to establish desirable motion patterns.\* The crab meat extraction process will be divided into three parts: 1) body meat extraction, 2) claw leg meat extraction, and 3) leg meat extraction.

\* Although this manual can be used effectively without motion pictures, a 16mm sound-color film describes in considerable detail each movement at regular and slow motion speeds. The film may be purchased (approximately \$ 200. ) or rented (approximately \$ 8.00 per week) from the Audio-Visual Department, Oregon State University, Corvallis, Oregon 97331.



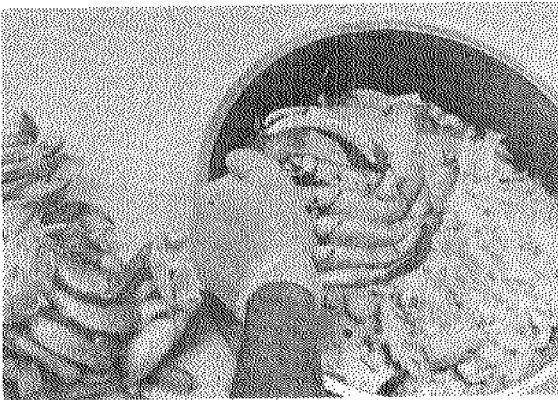
1. Crab body section

A crab body section is composed of 1/2 of the crab's body, four legs and a claw leg.



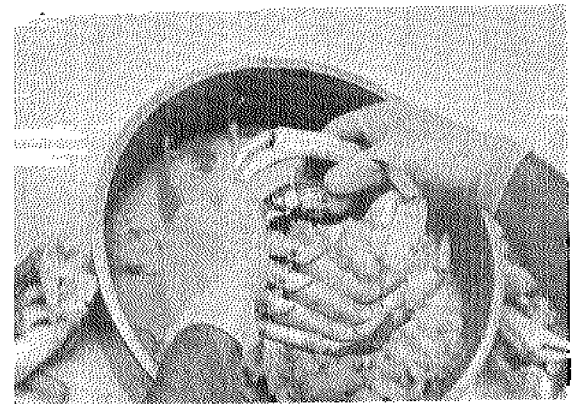
2. Grasp crab section

Grasp the body portion of the crab section with the fingers of the left hand.



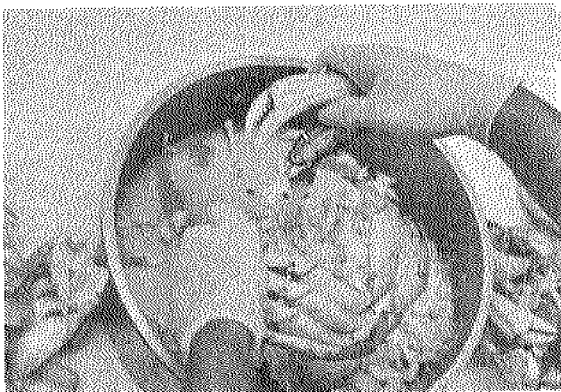
3. Squeeze body portion of section

While moving the crab section from the table to the right hand, the fingers of your left hand should press the body portion against the palm of your hand. .47



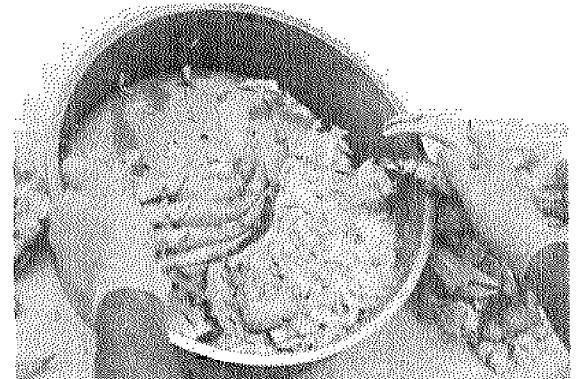
4. Grasp claw leg

When the section meets the right hand, grasp the claw leg with the right hand.



5. Tear off claw leg

Using your right hand, tear off the claw leg. .95



6. Hit out body meat

Using a firm hitting base, hit out the body meat sticking to the claw leg in 2 hits or less. .95



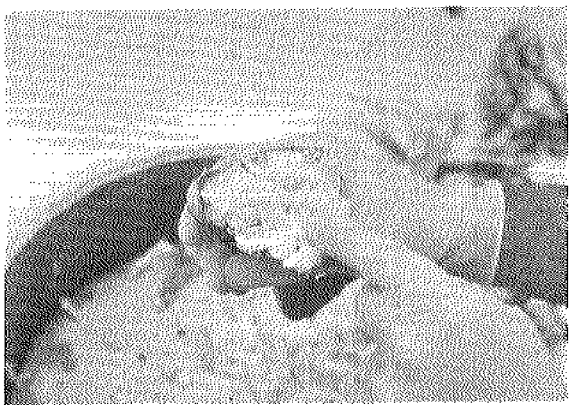
### 7. Discard claw leg

Discard the claw leg into a pile just to the right of the meat pan.



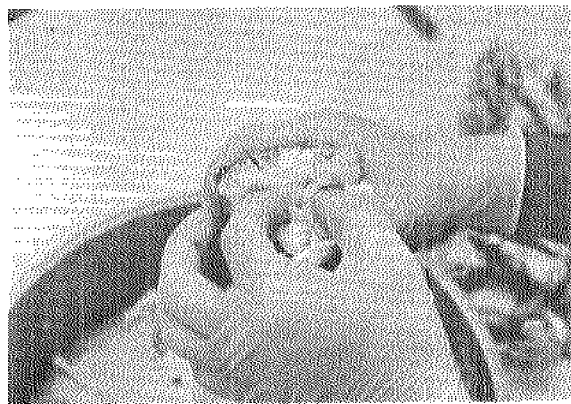
### 8. Grasp legs

With your right hand, move to and grasp the legs of the crab section. (Your hand should be on top of the legs, and the bottom of the crab facing up.)



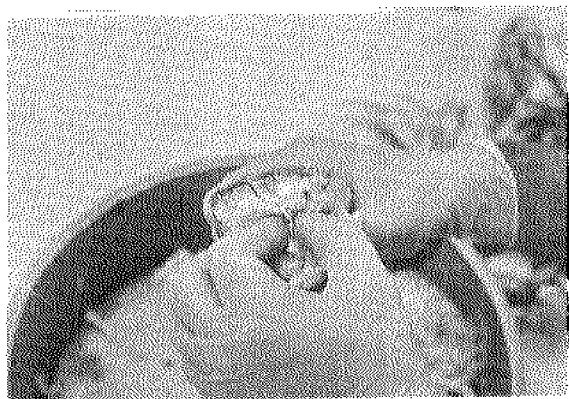
### 9. Key bone

Remove the key bone with the fingers of your left hand, as follows:



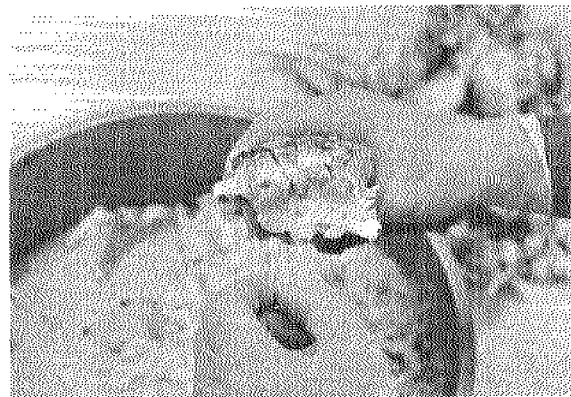
### 10. Insert fingers around key bone

First, insert your fingers into the area around the key bone;



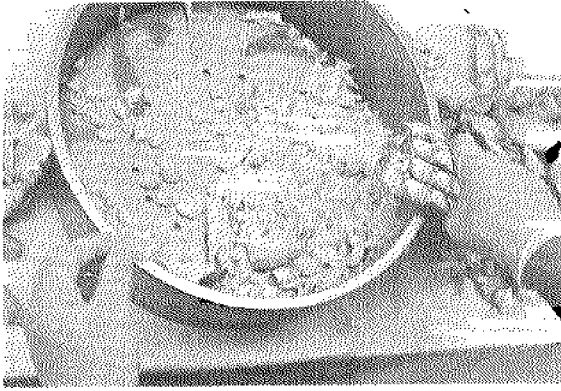
### 11. Grasp key bone

Second, grasp the bone;



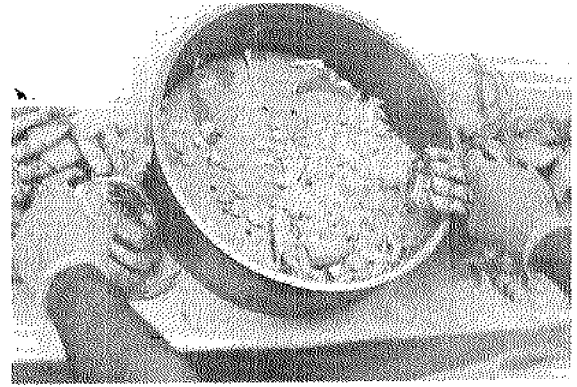
### 12. Remove key bone

Third, remove the bone by a twisting-pulling action. 2.61



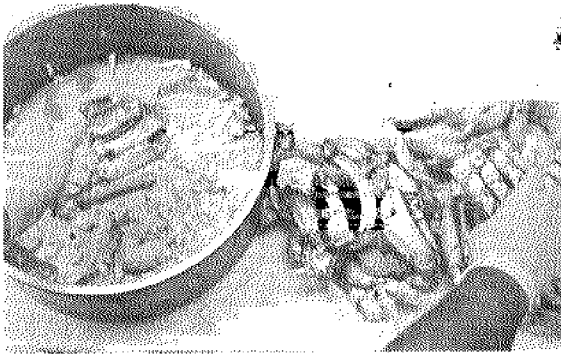
### 13. Discard bone - Hit out meat

Discard the key bone, while the right hand hits out the body meat in 3 hits or less. 1.65 .113



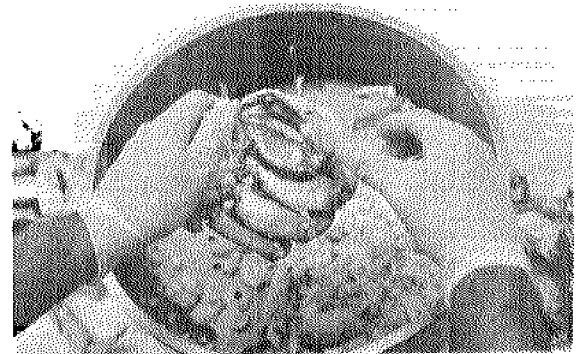
### 14. Grasp next section

With the left hand, reach for and grasp the next body section, while the right hand completes the body meat removal.



### 15. Discard section - squeeze new section

After the body meat is removed, discard the present body section with the legs attached into a pile just to the right of the claw legs. .47

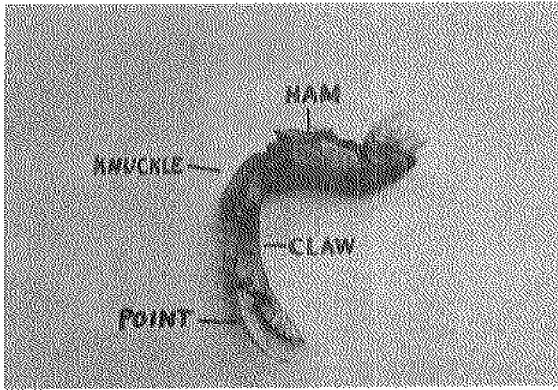


### 16. Begin new cycle

Bring your hands together and begin another picking cycle. (see picture 4).

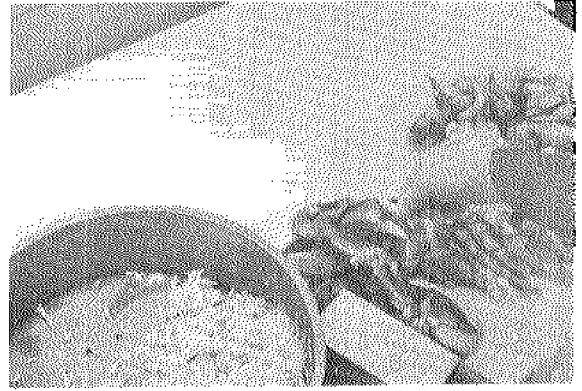
## BODY PICKING - POINTS TO REMEMBER

1. The claw legs and the discarded body sections with the legs attached should be placed in separate piles. Separate piles for body parts will enable you to keep a constant picking rhythm for each part, which would otherwise be interrupted if the claw legs and legs were mixed. (pictures 7, 15).
2. All distances moved should be as short as possible. (pictures 2, 7, 8, 14, 15).
3. Loosen the body meat by squeezing the body portion of the section between the fingers and palm of the left hand while moving the body section from the table to the right hand. Too much squeezing pressure will break up the meat. (picture 3).
4. Use a firm hitting base for meat removal with a minimum number of hits. (pictures 6, 13).
5. Complete and proper key bone removal allows all the meat to come out in high quality chunks. (pictures 9, 10, 11, 12).
6. When hitting the body meat, the right hand should be on top of the legs with the bottom of the crab facing up. (pictures 13, 14).
7. Use both arm and rapid wrist movements when hitting out the body meat. (pictures 13, 14).
8. Keep both hands in motion doing different jobs. (pictures 13, 14, 15).



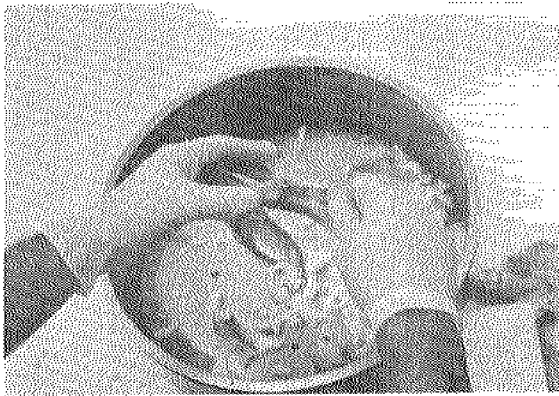
### 1. Crab claw leg

A claw leg consists of the ham (meris) joint (carpus), claw (manus) and point (dactylus).



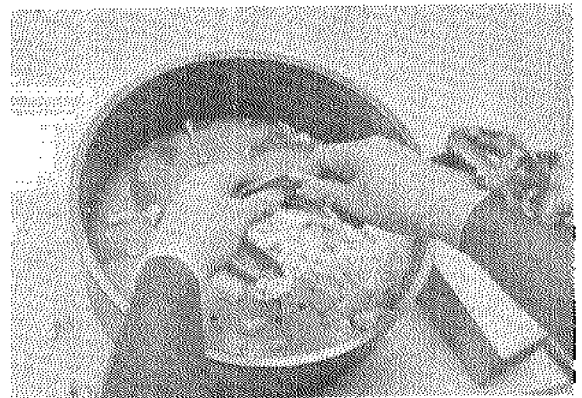
### 2. Grasp point

Grasp the point of the claw leg with the fingers of your right hand when getting a leg from the pile.



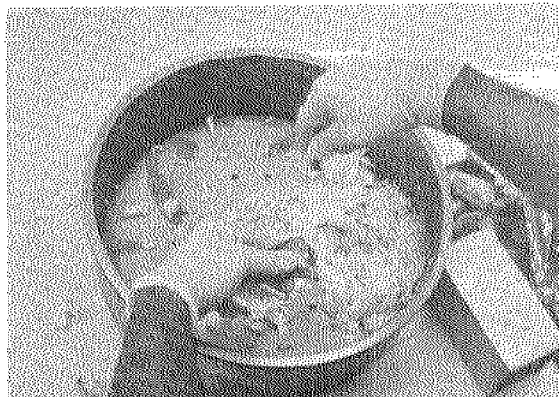
### 3. Transport leg

Move the claw leg from the pile to your left hand.



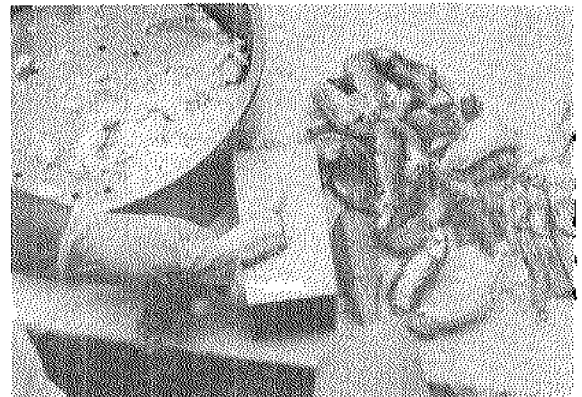
### 4. Grasp leg

Grasp and hold the ham end of the claw leg with your left hand. .20



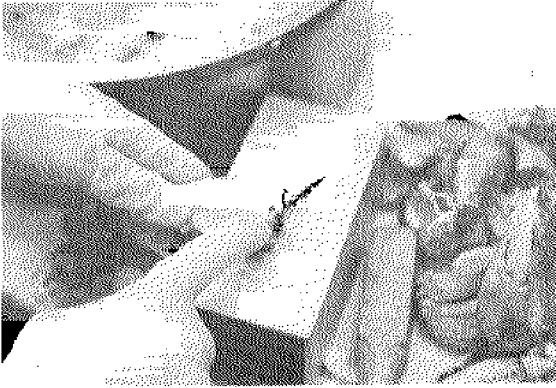
### 5. Tear off point

Tear off the point held in your right hand by bending it away from the claw. .67



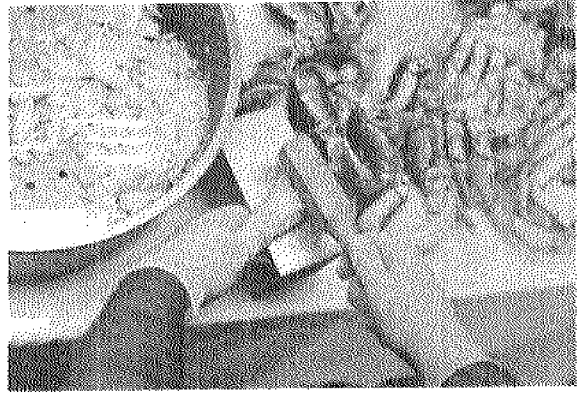
### 6. Get hammer - position leg on anvil

Discard the point and grasp the hammer, while your left hand positions the claw end of the claw leg on the anvil.



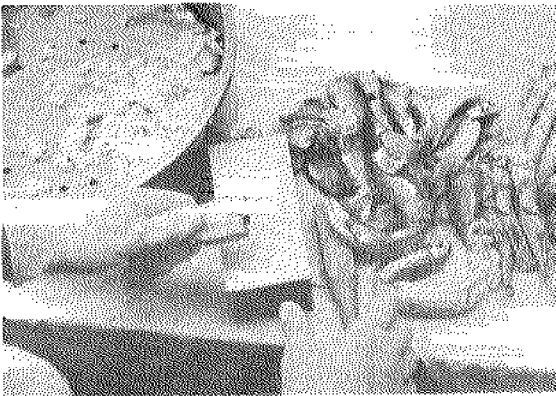
#### 7. Red dot on claw

Hit the red dot on the end of the claw shell.



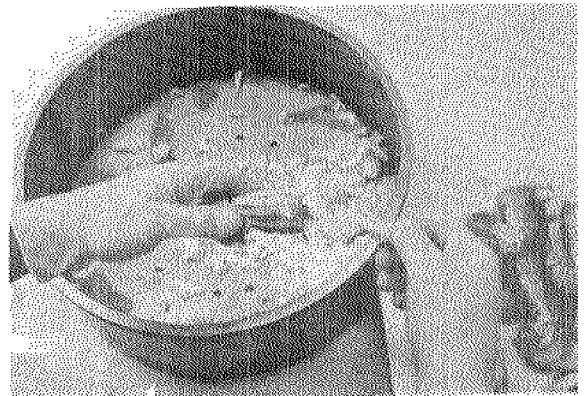
#### 8. Crack claw shell

Using 1 blow from the hammer strike the red dot and crack the shell as close to the point end as possible.



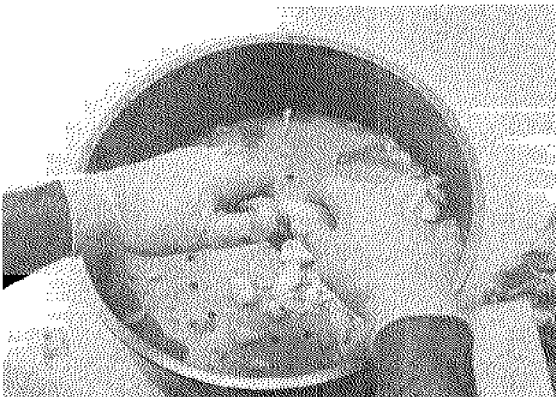
#### 9. Discard hammer

Discard the hammer.



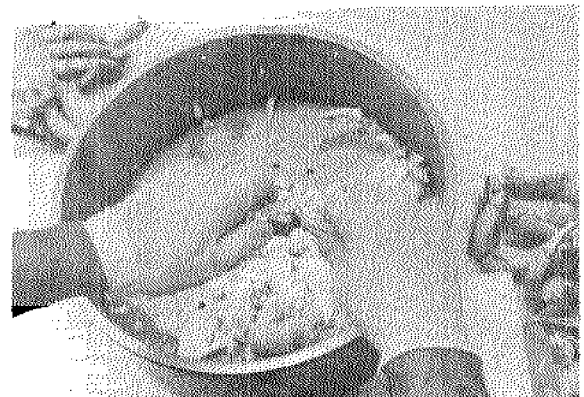
#### 10. Remove point end

Remove and discard the cracked point end of the claw shell. 2.07



#### 11. Grasp claw

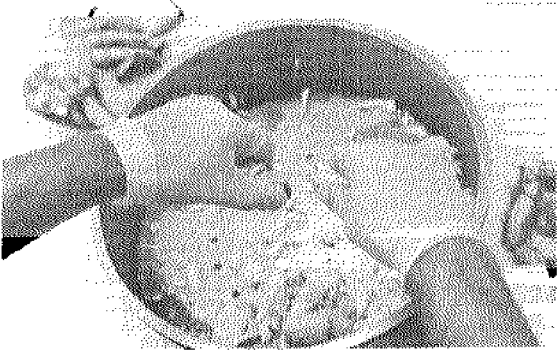
Tear off the claw shell and knuckle end as follows: First, grasp the claw end of the leg with your right hand.



#### 12. Bend claw's joint

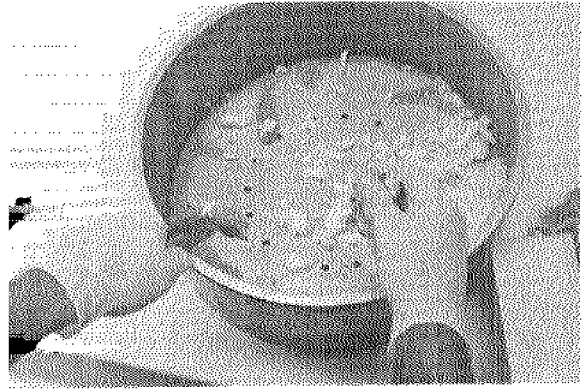
Second, bend the claw's flex joint in the direction opposite to its normal flex.





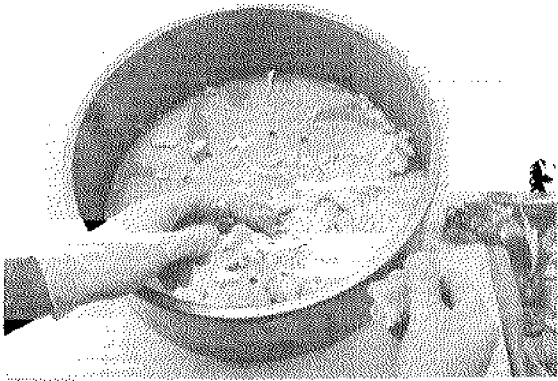
### 13. Tear off claw shell

Third, tear off the claw shell and knuckle end. 1.2



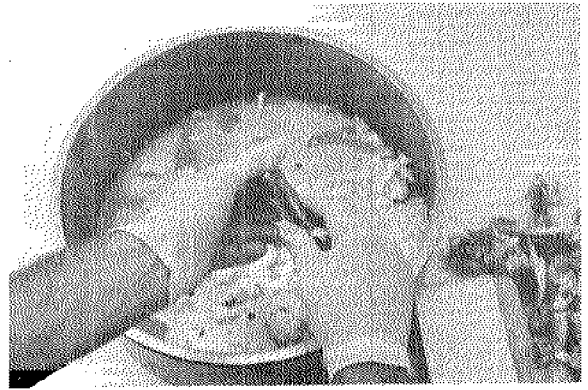
### 14. Hit out meat

With your left hand hit out the knuckle meat, while your right hand hits out the claw meat using 2 hits or less. 1.0 .021 .010



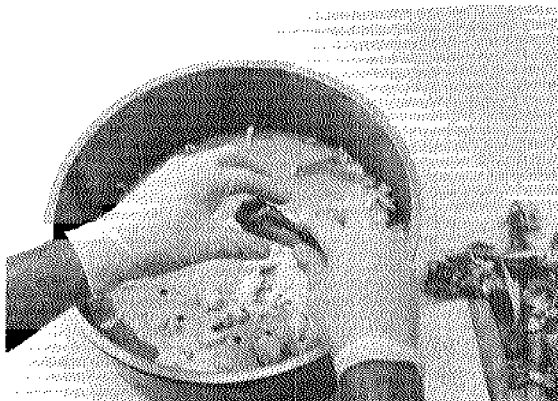
### 15. Discard shell

Discard the claw shell.



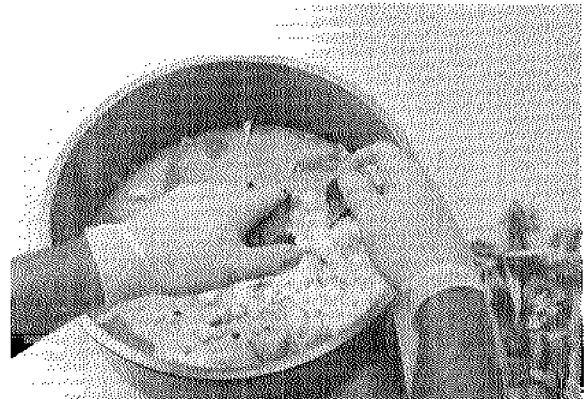
### 16. Grasp ham shell

Reposition the remaining parts of the claw leg as follows: First, with the fingers of your right hand grasp the body end of the ham shell.



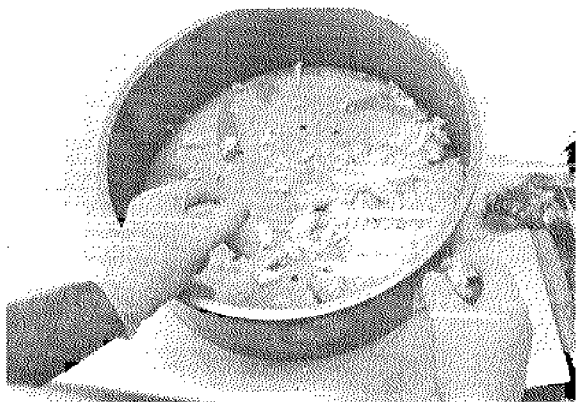
### 17. Regrasp knuckle end

Second, regrasp the knuckle end of the ham section with your left hand.



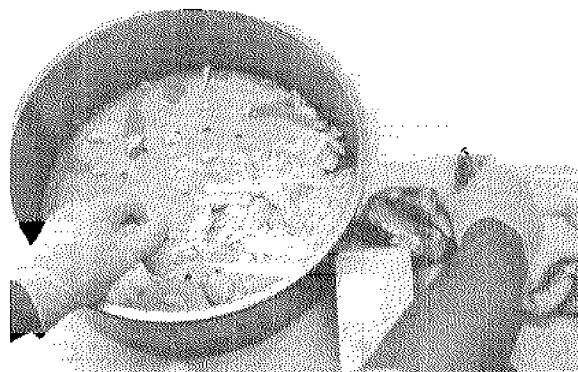
### 18. Remove ham shell

Remove the body end of the ham shell by a pinching, twisting, and pulling action. 1.46



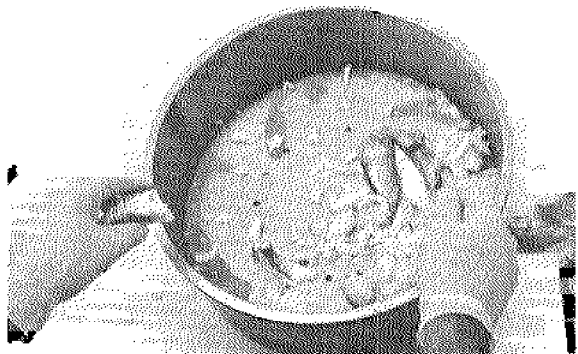
### 19. Discard shell - Hit out meat

Discard the body end of the ham shell, while your left hand hits out the ham meat using 2 hits or less. .93 .017



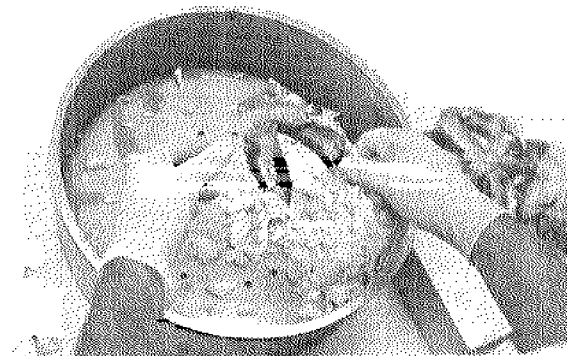
### 20. Grasp next claw leg

With your right hand reach for and grasp the next claw leg, while your left hand completes the ham meat removal.



### 21. Discard shell

Discard the ham shell. .27

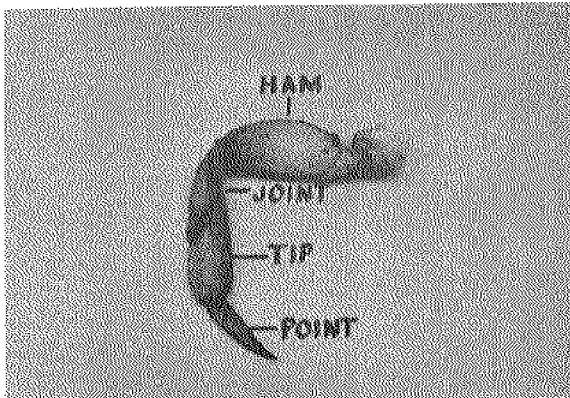


### 22. Begin new cycle

Bring your hands together and begin another picking cycle. (see picture 4).

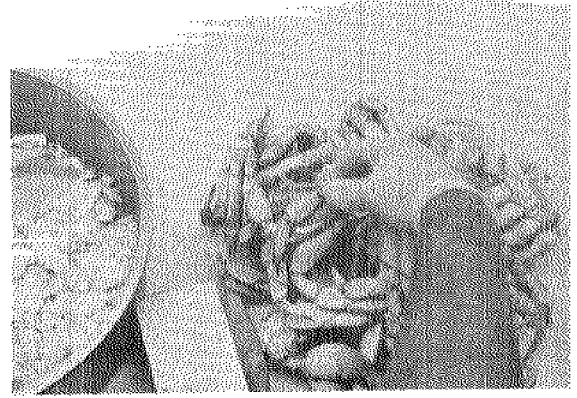
## PART II CLAW-LEG PICKING - POINTS TO REMEMBER

1. Remember, place your crab parts and equipment so all distances moved are as short as possible. (pictures 2, 3, 6, 9, 20).
2. The fingers of the right hand should grasp the point of the claw leg when getting a leg from the pile. The point is now in the fingers that will tear it off. (pictures 2, 3, 4, 5).
3. When cracking the claw shell, hit the red dot to open up the claw shell for easy meat removal. (picture 7).
4. Crack the claw shell as close to the point end as possible to avoid meat damage and waste. (picture 8).
5. After the hammer is used it should be placed where it can be easily regrasped. (picture 9).
6. Hit out the claw and knuckle meat at the same time. (picture 14).
7. Use a firm hitting base for meat removal with a minimum number of hits. (pictures 14, 19).
8. The body end of the ham shell is removed by a pinching, twisting, and pulling action. Care must be taken or the meat will be broken and possibly wasted if the shell is opened improperly. Tearing off the body end of the ham shell makes a bigger opening for the meat to come out. (picture 18).
9. Keep both hands in motion doing different jobs. (pictures 6, 14, 19, 20).



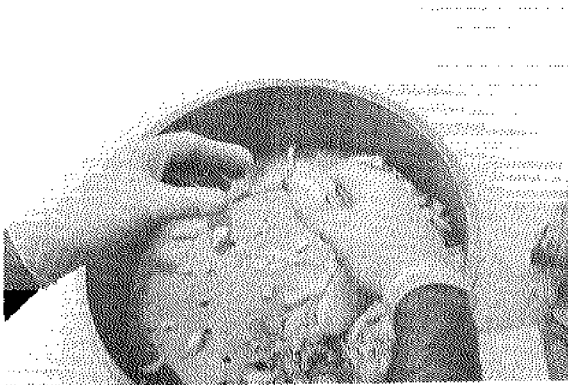
### 1. Crab leg

A leg is made up of the ham (merus) joint (carpus), tip (manus) and point (dactylus).



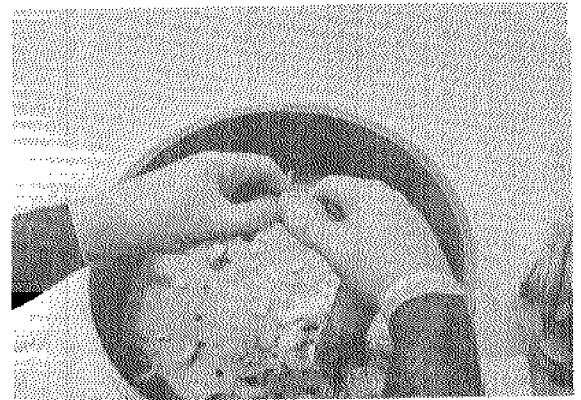
### 2. Grasp legs

Grasp the tip ends of a group of legs with your right hand.



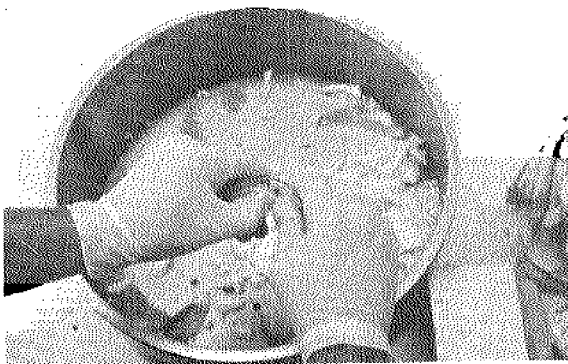
### 3. Transport legs

Move the legs from the pile to your left hand.



### 4. Grasp tip ends

As the hands are brought together, grasp the tip ends of the legs with your left hand.



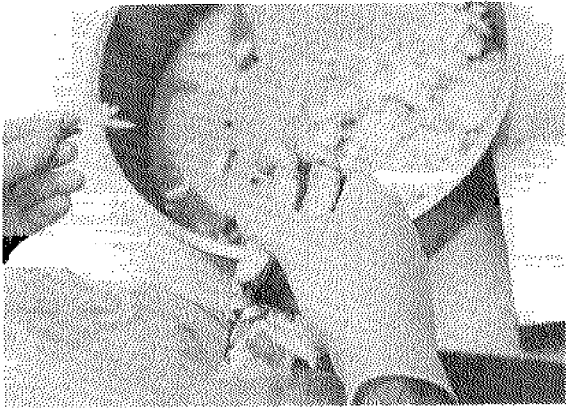
### 5. Bend points toward your body

With your right hand, support and hold the tip shells while your left hand tears off the points and tip ends as follows: First bend the points and tip ends toward your body.



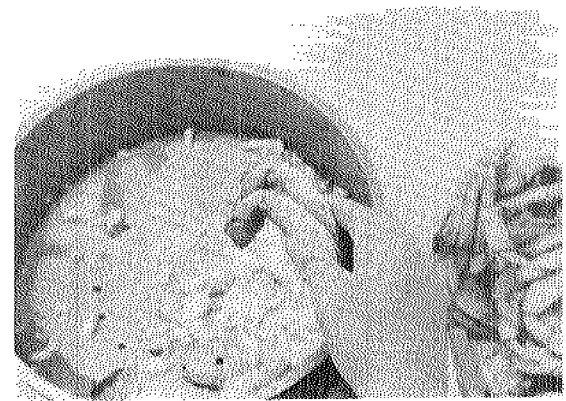
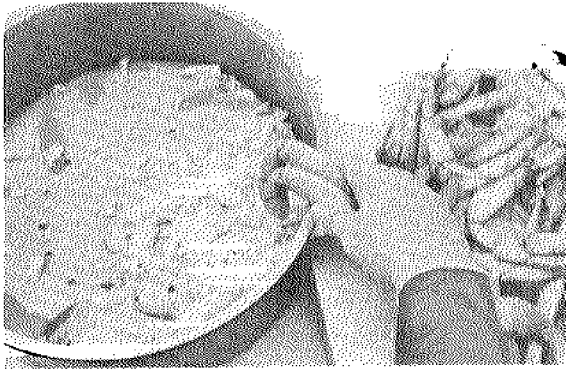
### 6. Tear off points and tip ends

Second, bend the points and tip ends away from your body and tear them off on this motion. The tip feathers should be clean with no meat sticking to them, and the tip shell should be opened enough for easy tip meat removal.



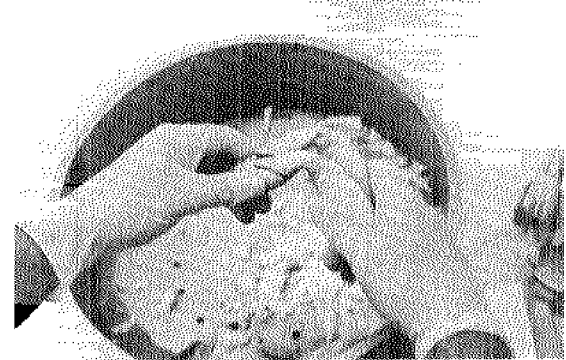
### 7. Reposition legs

Discard the points and tip ends, while your right hand repositions the legs by pushing the body end of the legs against your body, allowing the legs to slide forward in your hand.



### 8. Hold ham portion of legs

Your fingers should now be holding the ham portion of the legs.

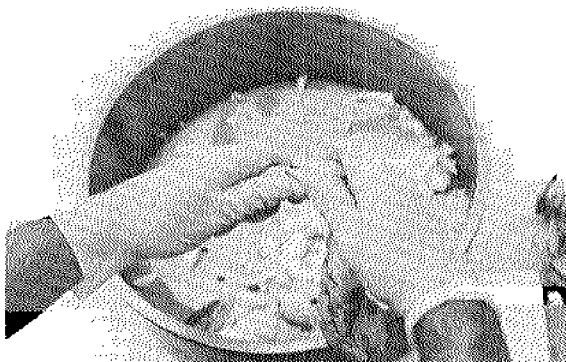


### 9. Hit out tip meat

Hit out the tip meat using 3 hits or less. .45 .004 .008

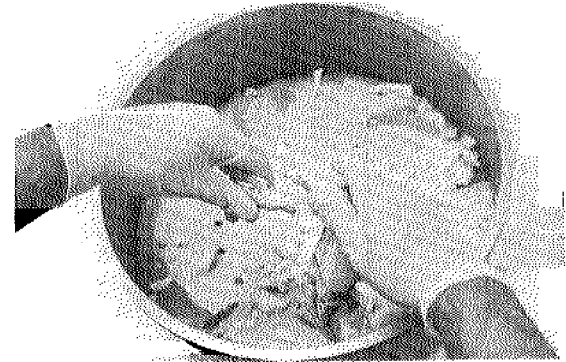
### 10. Grasp tips & joint ends

Bring your hands together and grasp the tip shells and joint ends with your left hand.



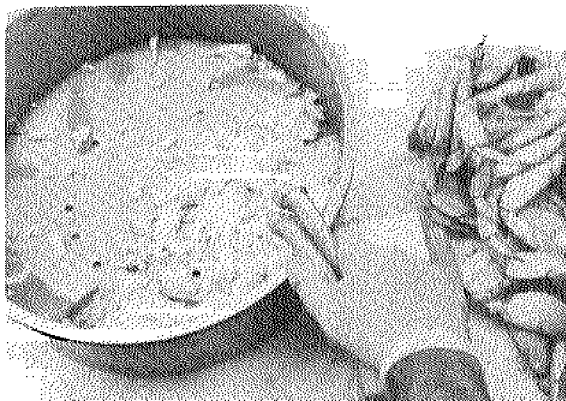
### 11. Hold legs at joints

Slide the fingers of your right hand forward to support and hold the joints.



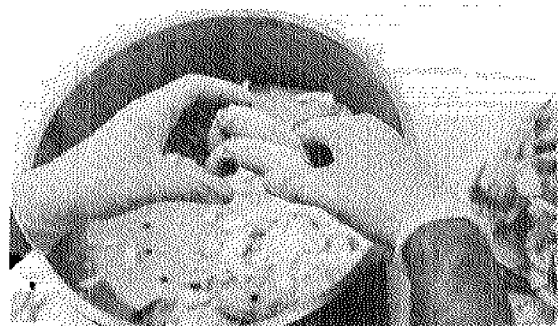
### 12. Tear off tips & joint ends

Tear off the tip shells and joint ends held in your left hand, using a single outward stroke. .45



13. Discard shells - Hit out meat

Discard the tip shells and joint ends, while your right hand repositions the legs and hit out the joint meat using 3 hits or less. .45 .003 .006



14. Transfer legs

Transfer the remaining leg parts to the left hand. Grasp the joint ends of the legs with your left hand.



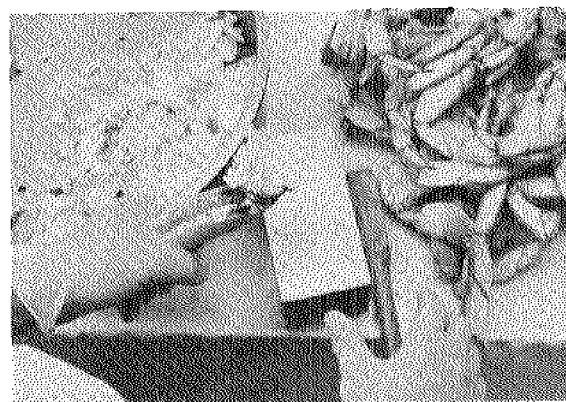
15. Position legs on anvil - Get hammer

Place the legs on the anvil while your right hand gets the hammer.



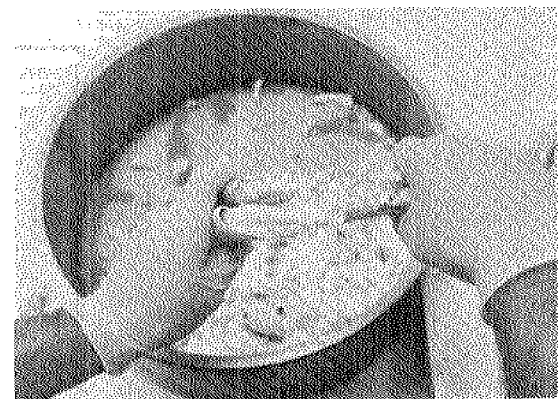
16. Crack ham shells

Crack the body end of the ham shells using 2 hits or less. .71



17. Discard hammer

Place the hammer so it can be easily regrasped.



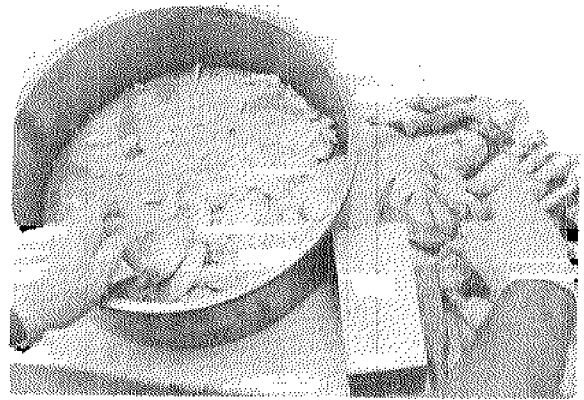
18. Open ham shells

Grasp the body end of the ham shells and tear off the shells using a twisting - pulling motion. .25



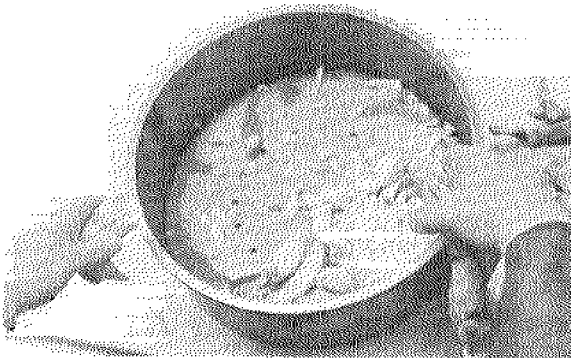
### 19. Discard shells - Hit out meat

Discard the ham shells, while your left hand hits out the ham meat using 3 hits or less. .60 .016



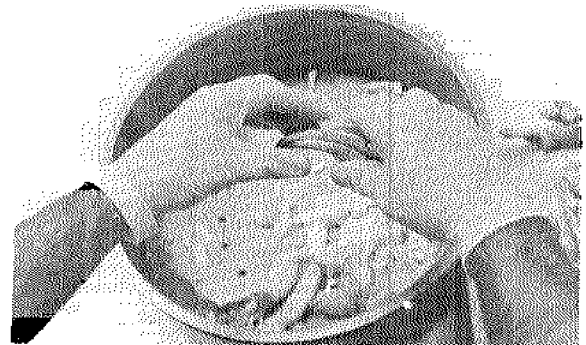
### 20. Grasp next group of legs

With your right hand grasp the next group of legs, while your left hand completes the ham meat removal.



### 21. Discard shells

Discard the ham shells. .14



### 22. Begin new cycle

Bring your hands together and begin another picking cycle. (see picture 4).

## MULTIPLE CRAB LEG PICKING - POINTS TO REMEMBER

1. Single crab leg picking is recommended in the first learning periods. After you become familiar with the techniques and procedures, the number of legs you pick at one time should increase. (pictures 2, 3).
2. When picking multiple legs, the legs are treated as a unit. In other words, the tips are lined up and torn off at the same time. (pictures 4, 5, 6).
3. Keep two things in mind when tearing off the point and tip end. First, open the tip shell as much as possible so that the meat will come out easily. Second, do not tear the tip shell off too far up the leg or the meat will be broken, and will stick to the point feathers and be thrown away. (pictures 5, 6).
4. Keep both hands in motion doing different jobs. (pictures 7, 13, 15, 19, 20).
5. When hitting out the tip and joint meat, be sure that you are holding the ham shell. Holding the ham shell allows the lower part of the leg to flop freely, thus aiding in meat removal. (pictures 9, 13).
6. Use a firm hitting base for meat removal and a minimum number of hits. (pictures 9, 13, 19).
7. After the hammer is used place it where it can be easily grasped, (picture 17).
8. Avoid removing any meat with the body end of the ham shell when it is torn off and discarded. (pictures 18, 19).
9. Remember, all distances moved should be as short as possible. (pictures 2, 3, 7, 13, 15, 17, 19, 20, 21).