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Artificial feeding of crabs (Cancer pagurus)

by

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Introduction

The crab fishery of Norway takes place mainly in the period August - November. In these months the meat content in the crabs is generally highest. However, in Norwegian waters the meat yield of the crabs seems to be very variable both within this time interval and also from one locality to another.

The main components of the edible crab for human consumption consist of the brown body meat, which is mainly composed of "liver" and reproductive tissue, and the muscle meat, which is white after processing.

The brown meat fills the carapace, and the white muscle fills the claws,the body and the legs.

Usually the muscles seems to be less variable in quality than the brown body meat. In a crab of excellent quality the brown body meat must be quite dry and firm after boiling.

The variation in quality has both known and unknown reasons. A recently moulted crab is in poor condition and when boiled it only yields a very small quantity of watery meat.

On the other hand when crabs which seems to have moulted long time ago also are in poor condition it is more difficult to give the reason.

Laboratory work, however, has shown that feeding decline rapidly with decreasing temperature.

In Norwegian waters the edible crab lives near the northern border of its distribution. The temperature, therefore, besides the food available is very important.

In order to provide crabs of quaranted quality for fresh consumption, artificial feeding of crabs has been under consideration. In Norwegian waters only the surface layer reach a temperature about 15-16°C during summer. An artificial feeding experiment therefore has to take place in or get the water from the upper water layer.

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An experiment taking this into consideration was made by the Institute of Marine Research, Bergen at Golten, southwest of Bergen in 1969.

Material and methods

A basin on the shore, about 140 square metres in area and 1 metre deep was used. The basin was supplied with seawater from about 2 metres depth by a pump.

When larger quantities of crabs are put together on a small area the claws must be set out of function to prevent the crabs from fighting and damaging each other. Norwegian crab fishermen use to cut the tip of the unmoveable part of the claw. This can be done by a light knock with the blunt edge of a sheath-knife, or pinched off with pliers. If the crabs are badly hurt in claws or legs they are able to shed these. Using the method mentioned the crabs keep their claws intact indicating that the operation is harmless.

During the experimental period from the end of July to the beginning of November 1412 crabs were used. The basin was drained five times during the period for cleaning and dead crabs were removed. 481 crabs or about 34 % died during the experiment.

The crabs were fed mainly with fresh fish and approximately 422 kg were used.

The temperature was measured from the beginning of August, and was at this time often higher than 18°C. It stayed rather high during August but decreased suddenly to 13°C at the beginning of September. It increased again during this month and was about 15°C near the end. Later it varied somewhat and was about 11°C at the end of October.

Approximately 150 hours were used for feeding, cleaning and maintenance work.

At the time the experiment started a sample of about 40 crabs were taken and given the following treatment and examination: The crabs were placed in cold salted water in a pan with a grate in the bottom and boiled. Investigations have shown that this is the most lenient method in boiling crustacea; the animals goes dormant as the temperature increases slowly and they reach the limit of temperature tolerance. Furthermore, crabs boiled by this method do not shed the claws and legs or release fat etc. to the same degree as when put directly in hot water.

After boiling for 15 minutes legs and claws were removed and the rest was weighed. Next the crab was "opened" but the wentral part of the shell body was put back again in the caparace, and the crab was placed in an upright position, permitting the water inside to drain out slowly for 2 hours. Now the crab was weighed again and the difference between the two weights give the amount of water.

Then the crab was opened again and all the brown body meat was removed from the shell and body and weighed.

In fact all the crabs meat ought to be taken into consideration. However, this would have complicated the investigation seriously, first because the crabs often have lost one or more claws and legs; and second it is very intricate to clean claws, legs and body thoroughly. Furthermore, the brown body meat gives a good indication of the quality of the crab. Therefore, only the weight of the brown body meat in relation to the body weight has been calculated.

Later, when samples were taken of crabs fed in the basin, samples of newly fished crabs from the sea were also obtained for comparison.

Results

Figure 1 shows the results of these samples with fitted regression lines. The mean weight of the brown body meat in percent of body weight increased in the period of feeding, a little more for females (from about 17 to 27 %) than for males (from about 17 to 24 %).

The difference in weight increase between fed and unfed females is very marked, while the males show no significant difference.

Table 1 shows the mean percent of brown body meat in crabs caught in the area 3 September and fed to 2 November.

Even though the feeding in this case has taken place in a rather shorter period, there is a marked increase in the precent of brown body meat, especially for females.

The weight of the brown body meat compared with the weight of the crab gives a good indication of the quality. Some of the boiled crabs, both fed and unfed were of excellent quality, and the weight of the brown body meat exceeded 36 % of the crab (without claws and legs).

As the crabs fed had a lower a mean value (28 % brown body meat) the possibility of improving the meat yield further by feeding seems reasonable.

Discussion

The difference in the weight increase of the brown body meat between males and females is possibly explained by the growth of the female gonads. Usually, the reproductive tissue of the females makes up a greater part of the brown body meat than the males.

The great difference in the weight of brown body meat between fed and unfed females can not be explained by the feeding alone. Occasionally, maulting occurred in the basin and newly moulted animals were eaten by the other crabs. In the samples from the basin therefore, soft crabs did not occure, while samples from the sea contained crabs of all categories.

The mortality rate in the basin seems to be rather high. At present it is impossible to explain this high mortality. The condition of the crabs is of course very important, together with the circulation of the water in the basin. During the experiment the pump did not work continously and this perhaps resulted in lack of oxygen in shorter periods.

Conclusions

It seems possible to obtain crabs of excellent quality for fresh consumption by artificial feeding. In the present experiment the price from producer would be about N.Kr. 4,40 per crab. This price is to high for canneries, but a smaller quantity could

perhaps be sold for private consumption locally or for export. On the other hand, if the high mortality rate could be reduced the price would be more acceptable.

Summary

In order to study the improvement of the meat yield, crabs were fed in a basin for about 3 months. The results show that artificial feeding is possible, females showing a better increase in weight percent in the brown body meat than males.

Table 1

The brown body meat in % in crabs (males and females) caught 3 September 1969 and fed to 2 November 1969.

	Brown body meat in %	
	Males	Females
Caught 3 September 1969	15,9	16,8
Fed to 2 November 1969	21,9	28,3

Figure 1

Feeding of crabs. The points are the mean values of the different samples. The lines are calculated on the basis of the individual values. 1) Not fed, 2) fed. A)Males, B) Females.