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Cooking and Cleaning Losses in Canning Tuna[1]

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THIS WORK was carried out to learn how much weight tunas lose at different stages in the canning process. The amount lost in cleaning is of interest to statistical workers who frequently have to convert cleaned weight into round weight; while law enforcement officers have to be sure that the cleaned fish in canneries were not under the legal weight limit when round. Besides this, cannery officials like to know when the loss at any one step in the canning process becomes excessive.

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When tunas are taken to a cannery, they are first weighed then given to cleaners, who remove the entrails. The next process is to steam-cook the fish for a length of time, which varies with species, size, fatness, etc., then they are allowed to cool, and sometimes to stand an extra day. After this the head, skin, dark meat, fins, and bones are removed, leaving nothing except white meat which is then sliced and placed in cans with a little oil and salt.

The first load examined consisted of iced yellowfin tuna from Mexico. Sixty of these fish, ranging in weight from six to twenty pounds, were taken from the cannery floor a few at a time, weighed, placed on a cleaning table and reweighed after they had been given the preliminary cleaning by regular cannery workers in the routine manner.[2]

The fish examined were then placed on trays and steam-cooked in the standard way. The rack containing the trays was marked and each tray numbered to make it easy to keep track of the fish and to reweigh each one after cooking. To get the weight accurately it was frequently necessary to make use of the theorum, "the whole is equal to the sum of all of its parts." In other words, the fish were much inclined to lose outlying portions of their anatomies as they were removed from the trays. The length of time the yellowfin were cooked was not ascertained, but was the same for all—a condition which would not be likely to occur ordinarily as larger fish are usually cooked longer.

One hundred and three skipjack were treated similarly. These fish were also from Mexico and had been on ice for ten days. Cooking in this case was for three hours at 220 degrees Fahrenheit. The rack was weighed ten hours after cooking and again twenty-four hours after that to ascertain the loss on standing. After the second weighing of the rack the individual fish were weighed and returned to the rack. They were then taken to the cleaning room and given to two regular employees of the cannery who removed skin, dark meat, bones, and in fact everything but the white meat which goes into the can. The white meat of each fish was weighed separately.

In examining the figures it should be borne in mind that they are the result of only one run of fish of each kind, that differences in the technique of the cleaners, length of cooking time, temperature used, fatness of the fish, and so forth, will each undoubtedly make some slight difference. Just how much could not be determined without an exhaustive series of tests. The figures therefore do not claim to be more than an approximation.

Yellowfin	*Per cent of round weight lost*	*Per cent of round weight remaining*
Yellowfin tuna (6 to 20-pound fish):		
Preliminary cleaning	7.5	92.5
Preliminary cleaning plus cooking after about 10 hours standing	36.0	64.0
Skipjack (3½ to 10½-pound fish):		
Preliminary cleaning	7.0	93.0
Preliminary cleaning plus cooking after about 10 hours standing	34.0	66.0
Preliminary cleaning plus cooking loss after about 34 hours standing	35.0	65.0
Total loss after final cleaning had removed everything but white meat	69.0	31.0

[2] To carry out this preliminary cleaning the worker makes a small, lengthwise slit in the body cavity, then while reaching in and grasping the viscera with one hand, cuts them loose from the head with the other; a heave then slides the fish on its way and removes the viscera. The process takes less than five seconds. The fish are then rinsed and placed in the cooking racks.

This table gives the total loss up to and including each step mentioned. Percentage of round weight lost *at* each step can be figured by subtracting the loss up to and including the *previous* step from that including the stage in question; for example, the loss of skipjack on standing is 35 per cent less 34 per cent leaves a result of 1 per cent of round weight.

PRELIMINARY CLEANING LOSS

Preliminary cleaning loss appears to be about the same for all sizes of fish of the same species, *i. e.*, a small fish loses the same percentage of its weight as a large one.

PRELIMINARY COOKING AND CLEANING LOSS

Given the same amount of cooking, a small fish loses a slightly greater percentage of its weight than a large one. This is easily explained by the fact that the steam does not have to penetrate as far in a small fish and consequently cooks it more thoroughly in a given length of time. The skipjack sample under discussion would indicate that four-pound fish lose on the average about 1 or 1½ per cent more than eight-pound fish (*i. e.*, 1–1½ per cent of round weight).

LOSS ON STANDING

A load of skipjack which, when round, had weighed 622 pounds lost about seven pounds after standing an extra 24 hours, *i. e.*, about 1 per cent (the large platform scales used for this weighing would not check themselves within a pound).

TOTAL LOSS INCLUDING FINAL CLEANING

Here again the percentage loss is greater for small fish. In this case the difference seems to be about the same as that caused by the cooking (1–1½ per cent). Probably about half of this is due to cooking and half to the loss of small bits of white meat which the workers consider big enough to be worth saving from large fish, but not from small. Roughly half of the cooked fish is left after the final cleaning. Any loss which will amount to say 1½ per cent of the round weight in the cooked fish will be reduced to about one-half of that after the final cleaning, since one-half of the shrunken material is discarded and does not enter into the final weighing. There is a possibility that the waste parts of the fish, such as the head, dark meat, fins, etc., may lose nearly all that they are going to in the first part of the cooking, and that from then on the largest part of the loss is sustained by the white meat. This of course would invalidate the statement made above.

As mentioned at the beginning of the article the final cleaning was done by two workers. They happened to be quite different in technique and in the amount of white meat they retained. One worker in scraping off skin, dark meat, clotted blood, etc., retained white meat to the extent of 32 per cent of the round weight of the fish. This operator used long strokes of the knife and rarely went over the same ground more than once. The other worker was inclined to be more fussy and scraped with short strokes, quite frequently over the same ground. She retained white meat to the extent of only 28 per cent of the original weight. The difference would amount to about 80 pounds of

canned tuna per ton of fish. The worker who used long strokes, in addition to retaining a higher percentage of white meat, was able to clean about sixty fish while the other was doing twenty-six.

If the differences in the method of cleaning consistently produce this result, it would certainly be worth the while of the canners to teach the workers to use the more efficient method. We have no way of knowing if this would prove to be the case. Only two workers were tested and the differences in skill of these two might mean far more than the differences in method.

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