EFFECT OF REFREEZING ON QUALITY OF SEA TROUT FILLETS

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In certain fisheries, fishing craft may be absent from port for 6 to 10 days or sometimes longer. Fish caught during the first part of the trip may be a week or more out of water by the time the boats return to port. Since the catch is held at the temperature of melting ice during this period, the fish will not be of the best possible quality when landed, nor will the fillets that are prepared from them be of the highest attainable quality.

Many of these fillets are frozen and held in storage for relatively long periods. Since best results in frozen storage are obtained with products of the highest initial quality, the need for preparing fillets for freezing from fish in strictly fresh condition is apparent. Presumably prime quality fish for filleting could be obtained if the catch were frozen as soon as caught and kept frozen until landed or even longer. In shore stations, fillets could then be cut from the partially or completely thawed fish, packaged, and refrozen.

In order to obtain data on the effect of such a procedure on the quality of the fillets, preliminary tests were conducted at the Service's laboratory in College Park, Maryland. In October 1947, fresh sea trout (Cynoscion regalis) weighing from 1 to 1½ pounds were obtained from a packer in the Chesapeake Bay area. These fish had been taken from traps just before noon and were brought in crushed ice to the laboratory in the early part of the afternoon of the same day. They were in rigor at the time of arrival at the laboratory.

The fish were then divided into lots as follows:

1. One lot was immediately frozen in the round;
2. Another lot was filleted immediately and the fillets packaged and frozen;
3. A third lot was held in the round in crushed ice for four days, then filleted and the fillets packaged and frozen.
4. Also, after four days, the round fish which had been held frozen were further divided into two lots, one being allowed to thaw partially and the other to thaw completely, and fillets were then cut from each of these lots, packaged, and frozen.

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Four groups of frozen fillets which had been treated in different ways were thus obtained:

A. Fillets cut from fish within a few hours after being taken from the water.

B. Fillets cut from fish held in the round in crushed ice for four days.

C. Fillets refrozen after being cut from fish frozen in the round within a few hours after being taken from the water, held frozen for four days, and then partially thawed.

D. Same as C, except the frozen fish were completely thawed.

The fillets were packaged by wrapping pairs of fillets tightly in moisture-vaporproof cellophane before being frozen. All freezing was done at -20° F. and the fillets were stored at 0° F. Periodically, three packages of fillets from each group were removed from storage for organoleptic examination and determination of the quantity of "drip" which occurred upon thawing. The results of the "drip" determinations and palatability scores are shown in Tables 1 and 2. The quantity

Table 1.--Average amount of "drip" in percent by weight for three samples from each group of frozen fillets after varying periods of storage.

Months in Storage	Groups of Fillets			
	A	B	C	D
	%	%	%	%
¼	1.3	1.2	2.1	1.9
4	1.0	1.4	2.9	2.4
6	1.6	1.6	3.0	2.6
8	1.3	1.5	2.9	2.8
10	1.4	1.5	2.9	2.7

of "drip" remained relatively constant throughout the 10-month storage period. It is of interest to note, however, that the amount of "drip" obtained from refrozen fillets cut from fish frozen in the round was about twice that for fillets frozen only once, although in no instance were the values unduly high.

Table 2.--Average palatability scores for three samples from each group of frozen fillets after varying periods of storage.

Months in Storage	Groups of Fillets			
	A	B	C	D
		(100 equals maximum score)		
¼	98.6	96.3	99.2	97.7
4	96.1	93.4	92.6	93.8
6	94.9	94.9	93.6	93.6
8	88.4	86.7	86.9	88.3
10	82.7	83.6	80.9	84.6

No appreciable differences in palatability scores are apparent between groups. At the eighth-month period, however, the quality of the samples in all the groups became less desirable, particularly in relation to flavor of the cooked product. This was especially true after 10 months, at which time the tests were terminated.

It was found that in filleting fish in a partially thawed condition, the filleting operation was slowed considerably due to the difficulty in distinguishing between the "feel" of the relatively hard, partly frozen flesh, and the bones. Possibly more experienced filleters would not be bothered by this condition, however.

These tests, though only preliminary, indicate that immediate freezing of sea trout, with subsequent thawing, filleting and refreezing of the fillets, causes no marked adverse effect on quality over fillets prepared from freshly-caught fish and then frozen.

FREEZING FISH AT SEA

FREEZING EQUIPMENT ABOARD
A MODERN TUNA CLIPPER

The tuna fishery employed crushed ice as a refrigerant for many years before the inadequacy of this type of cooling was realized. It was when the tuna clippers extended their trips into subtropical waters that it became evident that it was impossible to carry sufficient crushed ice to return with fish in first class condition. During the middle 1920's some of the larger of the tuna clippers installed mechanical chilling, with ice as auxiliary refrigeration. These installations consisted of direct expansion coils directly under the deck and along the sides of the fish hold. The cork insulation was increased on the walls of the hold.

It was not until about 10 years later that a satisfactory method for refrigerating the tuna on the vessels was devised. At the present time, all of the larger tuna clippers make use of a brine chilling and freezing system for keeping the fish in good condition until they are brought to port.

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