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Freezing and Cold Storage of Cat Fish Fillets

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The freezing and cold storage changes occurring in skinless fillets of cat fish and the effect of packaging on the quality of frozen fillets during storage at—18°C were studied. Maximum shelf-life of 27 weeks was shown by fillets frozen as glazed (water) blocks and packed in polythene lined waxed cartons.

Cat fishes constitute one of the important fisheries of India, the average annual landings for the years 1971-'78 being 53,138 metric tonnes, accounting for 4.2% of the total marine fish landings. This is an unpopular variety of fish fetching very low price in our markets. It is not liked by many people in round form, mainly due to its unattractive appearance and peculiar smell. Filleting is one of the methods of improving the consumer appeal of such varieties of fishes. The technological aspects of production of fillets from different varieties of fishes have already been worked out (Perigreen *et al.,* 1979). The freezing and storage characteristics of fillets of seer fish have been studied by Shenoy (1976). Devadasan *et al.* (1978) studied the freezing and storage characteristics of fillets from six species of fresh water fishes. This paper reports the freezing and cold storage changes in skinless fillets of cat fish *(Tachysurus* sp.) and the effect of packaging on the quality of frozen fillets during storage at–18°C.

Materials and Methods

Cat fish were procured from landing places at Fort Cochin, brought to the laboratory immediately, washed well and stored in crushed ice. The fish were then separated into different size groups and skinless fillets were prepared (Perigreen *et al.,* 1979). Both filleting and skinning were done manually. The belly flaps and fins were removed from the fillets which were then thoroughly washed in potable water and drained for about 15 minutes. The yield of skinless fillets was noted. The fillets were then frozen in contact plate freezer at–35 to –40°C and stored as follows.

*1. Fillets frozen individually
*2. Individual fillets wrapped in polythene sheet (200 gauge) and frozen
*3. Fillets packed in plain waxed cartons (400 g each) and frozen as blocks
*4. Fillets packed in waxed cartons (400 g each) lined inside with polythene sheet (200 gauge) and frozen as blocks
*5. Fillets packed in waxed cartons (400 g each) lined inside with polythene (200 gauge), glaze water added to cover the fillets completely and frozen as blocks

After freezing, all the samples were stored at—18°C. Fresh fillets were analysed for moisture, fat, ash and protein according to the methods of AOAC (1960).

The changes in appearance, desiccation, discolouration and loss in weight (Table 2) of the frozen material were noted at specific intervals. The frozen fillets were thawed at room temperature and the yield determined (Table 3). The peroxide value (PV) and free fatty acid (FFA) contents of the fillets after thawing were estimated by the methods of Lea (1952) and AOCS (1946) respectively. The organoleptic tests were carried out after cooking the thawed fillets in 2% sodium chloride solution for 15 minutes.

* The samples have been designated by these numbers in the tables

Results and Discussion

The weight of individual cat fish used for the study varied from 1.6 to 2 kg and the yields of skinless fillets from 25-28% of the weight of whole fish. Weights of individual fillets ranged from 200 to 250 g. The fillets after washing in water had no unpleasant odour and their appearance was quite attractive. The proximate composition of the fillets is given in Table 1.

Maximum loss in weight occurred in individually frozen fillets stored without any packaging. But in the case of individual fillets frozen after wrapping in 200 gauge polythene sheet and stored at-18°C the loss due to evaporation of moisture from the surfaces was reduced considerably. Fillets packed in waxed cartons without any lining showed a loss of only 1.62% in weight after 23 weeks. Very little loss of weight occurred when the fillets were packed as blocks without adding glaze water in waxed cartons with an inside polythene lining. In the case of fillets frozen as glazed blocks and packed in polythene lined waxed cartons, the slight decrease in weight was due to the evaporation of glaze covering the frozen fillets and there was no loss of material due to desiccation as the frozen fillets were well protected by glaze as well as by packaging.

Table 1. *Proximate composition of cat fish fillets*

Moisture %	77.560
Protein % (TN x 6.25)	17.470
Fat %	3.212
Ash %	0.816

Table 2. *Weight loss during storage of frozen fillets at*—18°C *(as % in frozen condition)*

Storage period	Frozen fillet samples				
weeks	1	2	3	4	5
5	0.68	0.33	0.25	Nil	Nil
10	2.73	0.33	1.05	Nil	Nil
16	6.14	0.33	1.37	Nil	0.32
20	—	—	1.37	Nil	0.32
23	—	0.49	1.62	0.25	0.32
27	—	0.58	—	0.50	0.64
32	—	—	—	—	0.64

The yield of thawed fillets after 16 weeks was minimum (83.1%) in individually frozen fillets without any wrapping (Table 3). This was owing to the loss in weight during storage due to desiccation from the exposed surface of the fillets and to the drip loss occurring during thawing. Maximum yields of thawed fillets were obtained from samples packed in waxed cartons lined inside with polythene, as there was no loss due to desiccation during frozen storage. In these cases, the yields of the fillets after thawing were influenced by the quantities of drip lost during thawing. The drip losses (weight loss during thawing) in these samples slowly increased during storage.

The physical appearance of the frozen fillets and the organoleptic qualities of the

Table 3. *Percentage yield of thawed fillets*

Storage period	Frozen fillet samples				
weeks	1	2	3	4	5
0	94.70	95.65	94.86	95.53	95.40
5	93.33	95.33	93.75	95.00	95.50
10	89.67	94.67	92.50	94.00	95.00
16	83.10	92.00	90.00	93.20	94.00
20	—	91.06	90.46	—	—
23	—	89.00	88.33	93.75	94.25
27	—	86.67	—	88.25	89.80
32	—	—	—	—	88.00

Table 4. *Changes in physical appearance of frozen fillets during storage and organoleptic quality of the thawed fillets (after cooking)*

Storage period weeks	Frozen fillet samples					Thawed fillets after cooking				
	1	2	3	4	5	1	2	3	4	5
0	Good	Good	Good	Good	Good, completely covered with water glaze	Good	Good	Good	Good	Good
5	Slight desiccation and slight yellow discolouration	Good	Good	Good	–do–	Fair	Good	Good	Good	Good
10	Throughout desiccation and yellow discolouration	Good	Fair to good	Good	–do–	Poor, spongy texture and rancid flavour	Good	Fair, slight spongy texture	Good	Good
16	—	Ice formation on the surface at certain places	Slight yellow discolouration	Good	–do–	—	Fair to good	Fair to poor, slight off odour	Fair to good	Good
20	—	Slight discolouration	—	Ice crystal formation at few places on the surface	–do–	—	Fair	Poor, off odour and flavour	Fair	Fair to good
23	—	–do–	—	–do–	–do–	—	Fair to poor	—	Fair	Fair
27	—	–do–	—	–do–	–do–	—	Poor, off odour and flavour	—	Fair to poor	Fair
32	—	—	—	–do–	–do–	—	—	—	Poor	Fair to poor

Table 5. *Changes in PV and FFA of frozen cat fish fillets during storage at*—18°C

Sample	Storge period weeks	FFA (as oleic acid %)	PV (ml N/500 thio/g fat)
1	0	1.82	2.68
	5	3.15	12.04
	10	3.52	28.61
2	0	2.06	2.43
	20	4.60	16.12
3	0	2.13	2.18
	10	3.94	21.05
4	0	1.88	1.18
	20	4.01	20.06
	23	3.87	32.16
5	0	1.73	2.52
	23	3.12	21.74
	27	4.86	27.61

thawed and cooked fillets were significantly influenced by packaging (Table 4). The individually frozen fillets stored without any packaging developed desiccation and discolouration after 5 weeks at—18°C. After 10 weeks, these samples were completely discoloured and desiccation occurred on the entire surfaces of the frozen fillets. The samples also exhibited high rancidity. In block frozen samples without water glaze and packed in waxed cartons, the texture of the fillets became slightly spongy after 10 weeks. After 16 weeks, the samples became unacceptable with the development of rancid flavour, off odours, desiccation and discolouration. This is also accompanied by the increase in the peroxide values and free fatty acids (Table 5). The individually frozen cat fish fillets packed in 200 gauge polythene paper had a shelf life of 20 weeks at—18°C. Maximum storage life was shown by fillets frozen as glazed block and stored after packing in polythene lined waxed cartons.

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