

# Studies on Freezing and Storage of *Psenopsis cyanea*

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The freezing and storage characteristics of *Psenopsis cyanea* caught on board FORV Sagar Sampada from a depth of 350 m off Cochin are reported. The fat content of the fish was high (15.58% on the weight of whole fish) and the meat was white in colour. Peroxide value, free fatty acids and thiobarbituric acid values increased during frozen storage and organoleptically the fish was acceptable upto 32 weeks at  $-22 \pm 1^\circ\text{C}$ .

The freezing and storage characteristics of many of the Indian marine fishes have been studied (Mathen *et al.*, 1966; Pawar & Magar, 1966; Kamasastri *et al.*, 1967; Jadav & Magar, 1970; Shenoy & Pillai, 1971; Shenoy, 1976; Perigreen & Joseph, 1980; Badonia & Devadasan, 1980) and the frozen shelf-life of these fishes varied from 10 to 32 weeks depending upon the species, fat content, method of freezing and storage temperature (Perigreen *et al.*, 1985). But no work has been reported on the frozen storage behaviour of *Psenopsis cyanea*, a fatty fish which occurs in small shoals irregularly distributed off the east and west coasts of India. This paper summarises the results of the studies made on the proximate composition and freezing and storage of *Psenopsis cyanea* caught on board FORV Sagar Sampada.

## Materials and Methods

*Psenopsis cyanea* for the study were collected on board FORV Sagar Sampada from a depth of 350 m off Cochin during January 1985. The fish were washed immediately after catch, packed in polythene bags (2 kg each) within 1 h and quick frozen at  $-40^\circ\text{C}$  on board the vessel. After freezing (about 3 hours), the fish were transferred to the cold storage at  $-23^\circ\text{C}$ . On arriving Cochin (after 8 days) the frozen *Psenopsis cyanea* were removed from the vessel and stored in the frozen storage of the Institute at  $-22 \pm 1^\circ\text{C}$  and a portion of the material was analysed for proximate composition.

The frozen stored material was examined at regular intervals. The fish blocks were

thawed in running water at room temperature, meat separated and the meat with the skin was used for analysis. Moisture, protein, fat and ash were estimated by the method of AOAC (1975) and peroxide value (PV) and free fatty acid (FFA) by the method of Lea (1952) and AOCS (1946) respectively. Alpha amino nitrogen was estimated according to the procedure described by Pope & Stevens (1939) and thiobarbituric acid (TBA) value by the method of Tarladgis *et al.* (1960). The organoleptic characteristics of the fish cooked in 2% NaCl for 15 min were determined by a trained taste panel and the scoring was done using 10 point hedonic scale 10 being very good, 0 being bad and 4 being just unacceptable.

## Results and Discussion

The *Psenopsis cyanea* used for study had an average weight of 51 g and length 16 cm. The colour of the fish was grey with violet tinge. The proximate compositions of the whole fish as well as the meat with skin are given in Table 1. The flesh of the fish was white in colour and was rich in fat. The protein content was also reasonably high and the taste of the cooked meat was good.

Table 1. Proximate composition of *Psenopsis cyanea*

	Whole fish	Meat with skin
Moisture %	68.68	62.38
Fat %	15.58	20.39
Crude protein % (TN x 6.25)	12.68	16.72
Ash %	2.81	0.82

The changes in moisture, peroxide value, free fatty acid, alpha amino nitrogen and thiobarbituric acid values during frozen storage of *Psenopsis cyanea* are given in Table 2. During storage there was slight decrease in the moisture content. PV and FFA increased during storage. The increase in PV was not very high even at the end of the storage period during which the fish became inedible. The alpha amino nitrogen decreased during frozen storage. This may be due to the loss of nitrogenous constituents of the muscle in the drip during thawing of the fish. The TBA value showed a steady increase during frozen storage.

Organoleptically, the fish was acceptable upto 32 weeks at  $-22 \pm 1^\circ\text{C}$  (Table 3). The samples did not show any sign of development of rancidity or off flavour upto 22 weeks storage. But during storage of 28 to 32 weeks, slight rancid, flavour and slight

yellow discolouration of meat have been observed and on 36 weeks the fish became inedible. There was good correlation between organoleptic scores and the changes in peroxide value and TBA values of *P. cyanea* during frozen storage. The increase in PV was slow in *P. cyanea* compared to other marine fatty fishes, oil sardine and mackerel (Shenoy, & Pillai, 1971; Mathen *et al.*, 1966) and the frozen shelf-life of this fish was also found to be longer compared to oil sardine which had frozen shelf-life of 2 to 5 months depending upon fat content and seasons (Mathen *et al.*, 1966) even though *P. cyanea* contained very high amount of fat. One of the reasons for the longer shelf-life of *P. cyanea* may be attributed to the absolute freshness of the material

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Table 2. Changes in biochemical characteristics of *Psenopsis cyanea* during frozen storage

Storage period weeks	Moisture	PV mg.eq/kg fat	FFA oleic acid %	Alpha amino nitrogen mg/100 g	TBA value mg malonal-dehyde/kg
2	62.91	3.32	1.07	50.50	0.48
10	62.38	5.28	1.52	42.06	0.54
14	62.76	4.40	2.31	40.12	0.85
22	61.12	7.32	2.50	36.18	1.50
28	61.31	15.08	1.28	—	1.80
32	61.79	13.20	1.95	28.14	2.05
36	60.41	28.82	2.60	28.06	2.90

Table 3. Changes in organoleptic characteristics and overall score of *Psenopsis cyanea* during frozen storage

Storage period weeks	Organoleptic characteristics	Overall score
2	Meat - white, moderately soft and juicy, good flavour	9
10	"	9
14	Meat - white, moderately soft, juicy, " flavour - fair to good	7.5
22	Meat - slight dull colour, slight yellow colour at tail portion, moderately soft and juicy, flavour - fair to good	6.5
28	Slight rancid flavour of meat at tail portion, slight yellow discolouration, meat soft and slight dull colour	5.5
32	Slight rancid flavour, less juicy slight yellow discolouration, dull colour	4
36	Rancid odour and flavour, yellow discolouration	2

## References

- AOAC (1975) *Official Methods of Analysis* (Horwitz, W., Ed.) 12th edn. Association of Official Analytical Chemists, Washington
- AOCS (1946) *Official and Tentative Methods*, American Oil Chemists' Society, Ca, 5a, 40
- Badonia, R. & Devadasan, K. (1980) *Fish. Technol.* 17, 125
- Jadav, M. G. & Magar, N. G. (1970) *Fish. Technol.* 7, 146
- Kamasastri, P. V., Doke, S. N. & Ramanda Rao, D. (1967) *Fish. Technol.* 4, 78
- Lea, C. H. (1952) *J. Sci. Food Agric.* 3, 586
- Mathen Cyriac, Choudhuri, D. R. & Pillai, V. K. (1966) *Fish. Technol.* 3, 30
- Power, S. S. & Magar, N. G. (1966) *J. Fd Sci.* 14, 87
- Perigreen, P. A. & Jose Joseph (1980) *Fish. Technol.* 17, 31
- Perigreen, P. A., Jose Joseph & Nair, M.R. (1985) Paper presented at the meeting of International Institute of Refrigeration on Storage Lives of Chilled and Frozen Fish and Fish Products, held at Amberdeen (U.K.), 1-3 October 1985
- Pope, C. G. & Stevens, M. F. (1939) *Biochem. J.* 33, 1070
- Shenoy, A. V. (1976) *Fish. Technol.* 13, 105
- Shenoy, A. V. & Pillai, V. K. (1971) *Fish. Technol.* 8, 37
- Tarladgis, B. G., Watts, B. M., Margaret, T. V. & Duncan, L. (1960) *J. Am. Oil Chem. Soc.* 37, 44