

STUDIES ON MOLLUSCA OF SAURASHTRA COAST-III

COMPOSITION

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The paper presents the seasonal variations in moisture, protein, salt and ash in the meat of *Murex virgineus*, *Solen* sp., *Loligo* sp., *Sepiella inermis* and *Octopus* sp. Moisture and fat contents of twenty two species of mollusca are reported. Inverse relationship between protein and ash has been observed. Cephalopoda recorded higher meat, moisture and protein contents than amphineura, gastropoda and pelecypoda. Pelecypoda contains higher fat than amphineura, gastropoda and cephalopoda.

INTRODUCTION

Common marine gastropod, *Murex virgineus* of the Gulf of Kutch is consumed mostly by people of low income group. The razor clam, *Solen* sp., available throughout the year in the Gulf of Kutch, on the northern side of Gopi near Okha Port is consumed partly as food and partly as bait for long lining in Maharashtra region (Nagappan Nayar and Mahadevan, 1974). Suryanarayanan, Shylaja Kumari and Alexander (1973) have suggested exploitation of four molluscs including two species of cephalopods on commercial basis as they are excellent sources of protein and are rich in calorific value. Fat is an important component in determining the quality and food value of fish, since fatty fish has a higher calorific value (Stansby and Lamon, 1941). The present paper deals with seasonal vari-

ation in the chemical composition of five species and that in moisture and fat contents in twenty two species of mollusca.

MATERIALS AND METHODS

Several specimens of mollusca as given in Table I and II were collected from various centres of Saurashtra. Fresh specimens were used for the study.

Individual specimens were measured and weighed after cleaning, washing and removing adhering water with filter paper. Mantle length was measured in the case of *Loligo* sp. and *Sepiella inermis*. The shell of the live specimen was opened and the muscle was used for analysis in case of *Ischnochiton* sp., *Oliva gibbosa*, *Pitar erycina*, *Placenta placenta*, *Crassostrea gryphoides*, *C. cucullata* and *Pinna bicolor*. The digestive

systems were removed and edible tissues were used for analysis in the case of *Nerita domeyi*, *Astrea semicostata*, *Xancus Pyrum* and species of genera *Turbo*, *Murex* and *Thais*. The meat of mantle, arms and head of the cephalopods was used for analysis.

Moisture, protein, salt and ash were estimated by the methods described in a previous paper in this series (Sarvaiya 1977a). Fat content was estimated by the method of A. O. A. C. (1970).

RESULTS AND DISCUSSION

M. virgineus, *Solen* sp., *S. inermis* and *Octopus* sp. whose lengths varied between 51-100 mm., 69-127mm., 65-235mm., 29-145 mm. and 525-805 mm. respectively were used for the studies on seasonal variation. Table I shows seasonal variations in five mollusca. Table II presents the moisture and fat contents in the twenty two species of mollusca. 5.7-9.8%, 31.3-59.2%, 72.5-85.6%, 58.6-76.5% and 88.4-90.0% of meat was observed in *M. virgineus*, *Solen* sp., *Loligo* sp., *S. inermis* and *Octopus* sp. respectively (Table I). The meat content of cephalopods (58.6-90.0%) is comparatively much higher than the values reported by Sarvaiya (1977 a, b) for gastropods (3.5-54.8%) and pelecypods (3.6-41.3%).

During monsoon, the moisture contents of *M. virgineus*, (69.92-70.00%) and *Solen* sp. (75.00-85.20%) were lower than those during other seasons. Lower moisture contents were found during pre-monsoon compared to other seasons in the case of *Loligo* sp. and *S. inermis*. Moisture content (83.12 - 84.31%) was lower during monsoon than during winter (84.92%) in the case of *Octopus* sp. (Table I). Highest

moisture percentages (83.82-85.60%) were exhibited by cephalopoda followed by amp-heneura (84.49 %), pelecypoda (76.90 - 88.74%), and gastropoda (69.50-80.80%) (Table II). The moisture content in *M. virgineus* (69.92-76.13%) is lower than that reported by Suryanarayanan *et al.* (1973) for *Pila virens* (78.87%). The moisture contents in *Loligo* sp. (84.09-88.76%) and *S. inermis* (79.98-88.02%) are higher than those mentioned by Suryanarayanan *et al.* (1973) for *Loligo indica* (75.05%) and *Sepiella inermis* (74.78%) and by Pandit and Magar (1972) for *Loligo vulgaris* (79.73%).

In the case of *M. virgineus*, *Loligo* sp. and *S. inermis* the protein contents were high during pre-monsoon compared to other season/s. The protein content (75.34-81.38%) was high during monsoon in *Octopus* sp. (Table I). The protein content (67.38-75.25%) of *M. virgineus* is higher and lower respectively than those (59.94-70.63%) reported by Ansell, Sivadass and Narayanan (1973) for *Bullia melanoides* and that recorded by Suryanarayanan *et al.* (1973) for gastropods (75.32% and 76.20%).

The protein content of cephalopods is comparatively higher (72.63-86.10%) than most of the species of gastropoda and pelecypoda reported by Sarvaiya (1977 a, b).

Salt content was relatively high (1.57-5.34%) during monsoon in the case of *M. virgineus*. High salt content (3.7-5.0%) was noted during pre-monsoon while it was low (1.2-3.7%) during monsoon in *Solen* sp. Sarvaiya (1977 b) has reported low salt content during monsoon in three species of oyster. Low salt content was obtained during pre-monsoon in the case

TABLE I

SEASONAL COMPOSITION OF MOLLUSCS OF SAURASHTRA COAST

Species	Season	Length (mm.)	Total weight %	Meat %	Moisture %	Percentage on dry meat weight basis		
						Protein %	Salt %	Ash %
<i>Murex virgineus</i> (1) (Roding)	Pre-monsoon (Feb. to May)	51-100	15.2-139.5	7.1-9.0	70.65-75.18 (74.34)	67.38-75.25 (73.34)	1.30-4.51 (2.75)	6.90-8.50 (7.76)
	Monsoon (June to July)	55-80	22.7-70.1	5.7-9.6	69.92-70.00 (69.96)	68.25-73.50 (70.88)	1.57-5.34 (3.45)	7.60-8.00 (7.80)
	Winter (Dec. to Jan.)	60-70	22.3-43.0	6.0-9.8	75.32-76.13 (75.73)	70.88-74.38 (72.63)	2.58-3.43 (3.00)	6.80-6.93 (6.87)
<i>Solen</i> sp. (2)	Pre-monsoon (March to April)	78-124	11-49	32.3-45.7	72.80-86.20 (80.65)	—	3.70-5.00 (4.3)	7.60-10.80 (8.9)
	Monsoon (June to Sept.)	69-126	8-45	44.4-59.2	75.00-85.20 (78.7)	53.80-70.00 (61.25)	1.20-3.70 (2.73)	6.30-10.0 (7.83)
	Post-monsoon (Oct. to Nov.)	77-127	10-43	31.7-58.4	80.10-86.70 (82.4)	—	2.90-3.90 (3.4)	4.30-9.30 (6.6)

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<i>Loligo</i> sp.	(3)	Pre-monsoon (Feb. to May)	85-235	31-210	72.5-85.6	84.28-85.65 (84.59)	80.50-81.90 (81.36)	1.64-2.38 (1.90)	4.20-4.60 (4.45)
		Winter (Dec. to Jan.)	65-166	15-205	73.5-82.4	84.09-88.76 (86.92)	72.63-75.25 (73.94)	2.07-2.39 (2.23)	5.92-7.70 (6.81)
<i>Sepiella inermis</i> (F'erussac & d'orbigny)	(4)	Pre-monsoon (Feb. to May)	40-145	13-297	58.6-66.6	80.60-86.10 (83.26)	81.38-86.10 (83.74)	1.58-2.60 (2.11)	3.65-6.10 (5.12)
		Post-monsoon (Nov. to Dec.)	29-46	7-20	68.9-76.5	79.98-88.02 (84.00)	74.38-75.25 (74.82)	1.82-3.06 (2.44)	5.60-6.40 (6.00)
<i>Octopus</i> sp.	(5)	Monsoon (July to Sept.)	525-805	108-230	88.4-90.0	83.12-84.31 (83.72)	75.34-81.38 (78.36)	2.20-6.03 (4.32)	7.50-7.65 (7.58)
		Winter (January)	600	210	90.0	84.92	74.38	8.25	8.60

1. Centre of collection:- Poshetra (Lat. 22°25' N Long. 69°12' E)
2. Centre of collection:- Gopi area (Lat. 22°24' N Long. 69°04' E)
3. Centre of collection:- Off Dwaraka* (Lat. 22°23' N Long. 68°23' E)
Off Dwaraka† (Lat. 22°15' N Long. 68°45' E)
4. Centre of collection:- off Dwaraka*
Centre of collection:- off Dwaraka†
5. Centre of collection:- Poshetra

Note: Figures in parantheses are mean value.

TABLE II
COMPOSITION OF MOLLUSCS OF SAURASHTRA COAST

Species	Collection centre	Length (mm.)	Moisture %	Fat% (on dry meat weight basis)
<i>Ischnochiton</i> sp.	Okha (Lat. 22°28' N Long. Long. 69°05' E)	36-35	82.49	10.75
<i>Nerita dombeyi</i> Recluz	Okha	25-32	80.80	3.75
<i>Astrea semicostata</i> (Kiener)	Okha	7-25	75.01	2.74
<i>Turbo intercostalis</i> Menke	Okha	19-31	73.52	3.60
<i>T. coronatus</i> Gmelin	Okha	19-28	77.38	4.00
<i>Murex virgineus</i> (Roding)	Poshetra (Lat. 22°25' N Long. 69°12' E)	50-60	77.90	1.00
<i>M. trapa</i> Roding	Poshetra	100	74.36	2.06
<i>Murex</i> sp.	Okha	55-62	71.44	3.35
<i>Thais rugosa</i> (Born)	Poshetra	42-50	71.50	3.80
<i>T. rudolphi</i> (Lamarck)	Okha	40-60	71.06	4.05
<i>Oliva gibbosa</i> (Born)	Okha	16-29	76.91	8.10
<i>Cypraea</i> sp.	Okha	58-67	77.32	5.85
<i>Xancus pyrum</i> Linn.	Okha	85	69.50	2.85
		Mean	74.73	3.76
<i>Pitar erycina</i> (Linn'e)	Sikka (Lat. 22°27' N Long. 69°51' E)	60	88.74	8.21
<i>Solen</i> sp.	Gopi area (Lat. 22°24' N Long. 69°04' E)	96-100	81.66	6.25
<i>Placenta placenta</i> (Linn'e)	Poshetra	110-145	84.81	9.80
<i>Crassostrea gryphoides</i> (Newton & Smith)	Balapur (Lat. 22°27' N Long. 69°08' E)	82-174	76.90	13.25
<i>C. cucullata</i> (Born)	Balapur	90-110	85.25	14.50
<i>Pinna bicolor</i> Gmelin	Sikka	120-240	76.90	13.25
		Mean	82.34	10.84
<i>Loligo</i> sp.	Off Dwaraka (Lat. 22°23' N Long. 68°23' E)	110-140	84.78	5.80
<i>Sepiella inermis</i> (F'erussac & d' orbigny)	Off Dwaraka	130	83.82	4.00
<i>Octopus</i> sp.	Sikka	250-300	85.60	4.75
		Mean	84.73	4.85

of *Loligo* sp. and *S. inermis*. *Octopus* sp. exhibited low salt content during monsoon (Table I).

Higher ash content (7.60-8.00%) was noted during monsoon compared to other seasons in the case of *M. virgineus*. Ash content gradually decreased from pre-monsoon to post-monsoon period in the case of *Solen* sp. Low ash content was observed during pre-monsoon compared to other seasons in the case of *Loligo* sp. and *S. inermis*. Higher ash content was noted during winter in the case of *Octopus* sp. (Table I). The ash content (6.80-8.50%) of *M. virgineus* is lower than the values (11.74-28.77%) reported by Ansell *et al.* (1973) for *Bullia malanoides*. The ash values obtained here for *Loligo* sp. (4.20-7.70%) and *Sepiella inermis* (3.65-6.40%) are lower than the values reported by Suryanarayanan *et al.* (1973) for *Loligo indica* (12.50 %) and *Sepiella inermis* (13.42 %).

From the study of seasonal variations in the chemical composition of these mollusca it appears that the protein contents increases with a decrease in the ash content and *vice versa* in all cases. Thus, an inverse relationship between protein and ash content is apparent in *M. virgineus*, *Loligo* sp., *S. inermis* and *Octopus* sp. Sarvaiya (1977 a, b) has reported similar relationship between protein and ash in *Thais rugosa*, *Crasostrea gryphoides*, *C. cucullata* and *Placenta placenta*.

Fat contents vary between 1.00 to 14.50% in mollusca, the lowest being in *M. virgineus* and the highest in *C. cucullata*. Generally higher fat contents (6.25-14.50%) were observed in pelecypoda and they were low (1.00-8.10%) in gastropoda.

10.75% and 4.00-5.80% of fat was noted in amphineura and cephalopoda respectively. Higher fat content was noted in all the cases when all body tissues were used for estimation (Table II).

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a brief account of ship stability in which the general principles and various definitions and terms used are highlighted. The last chapter titled 'Miscellaneous' describes the use and reading of Aneroid Barometer, uniform system of buoyage and wreck marking system and navigational marks. This chapter is made more attractive with coloured illustrations.

The 22 tables and 131 illustrations

with supporting captions are very valuable and informative which make the text easily understandable to the reader. In the appendix, a bibliography of current literature and useful addresses of fisheries interest are compiled. A good index comprising abbreviations, symbols and a glossary of navigational terms help to make the book a valuable addition to the library.

—N. A. GEORGE