STUDIES ON MOLLUSCA OF SAURASHTRA COAST - I
(AMPHINEURA AND GASTROPODA)

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Proximate composition of ninenteen species of marine gastropoda and one of marine amphineura have been studied. Seasonal variations in proximate composition of the meat of gastropod, *Thais rugosa* (Born), are reported. Majority of the gastropod species have high protein and ash contents.

INTRODUCTION

Ansell, Sivadas and Narayanan (1973) have worked on ecology and biochemical composition of four species of mollusca including one gastropod. Venkataraman and Chari (1953) have reported the chemical composition of the meat of *Xancus pyrum*. Sarvaiya (1976) has given the list of edible marine gastropoda of Saurashtra. However, information on the mollusca of this area is not available. In view of this and the increasing importance of the molluscan fisheries in Gujarat State and west coast as a whole, it called for a detailed study on the chemical composition of a large number of commonly available mollusca to gather information on their food value and other details. The findings of this study are reported in this paper.

MATERIALS AND METHODS

Specimens of mollusca were collected from various points as given in Table I during January 1975 to February 1976 and brought immersed in seawater to the laboratory.

Physical measurements including weight of individual specimens were taken after cleaning, washing and removing the adhering water with filter paper. The shells were broken, digestive systems removed and the edible tissues used for analysis in the case of *Turbo intercostalis*, *T. coronatus*, *Telescopium telescopium*, *Xancus pyrum*, *Tibia curta*, *Bursa spinosa*, *Tonna dolium*, *Pyrulla ficus* and species of genus Trochus, Murex and Thais. Whole animals were used for the studies in the case of *Onchidium verruculatum*.. All edible tissues were taken in the case of *Astrea semicostata*, *Nerita albicilla*, *N. dombeyi*, *Cypraea* sp. and *Ischnochiton* sp.

Moisture, ash and salt were estimated by the methods of A. O. A. C. (1970). Dried and powdered meat was preserved

TABLE I

COMPOSITION OF AMPHINEURA AND GASTROPODA OF SAURASHTRA COAST

Scientific name	Locality	Range mm. Length	Range mm. Circum-ference	Total weight with shell g.	Meat% (on total wt.)	Moisture %	Protein (%	Salt (as NaCl) on D. W.	Ash B.)
Ischnochiton sp.	Okha	30-55	20-40	2.2-8.2	20.0-31.7	76.42	56.88*	2.51	10.70
Onchidium verruculatum Cuvier	Poshetra	—	—	—	—	86.28	56.00*	8.21	18.60
Astrea semicostata Kiener	Okha	11-20	—	—	—	76.26	53.38*	2.96	13.60
Turbo intercostalis Menke	Okha	19-35	55-85	2.6-11.5	—	75.32-	70.88	1.94-2.75	8.00 - 10.60
T. coronatus Gmelin	Okha, Poshetra, Chusna Island, Balapur	18-50	74-98	4 0-22.8	8.3-11.6	73.45-76.26	72.63-78.75	2.30-4.23	7.20 - 12.00
Trochus radiatus Gmelin	Aramda, Adatra	16-21	—	—	—	81.60	70.00	6.84-8.15	11.10
T. stellatus Gmelin	Okha	20-23	—	—	—	77.57	68.25	2.30	10.20
Nerita albicilla Linn.	Okha	15-28	53-68	—	—	73.98-77.50	63.88*	2.51-4.23	12.60-13.95
N. dombeyi R'ecluz	Adatra	15-34	—	2.0-6.2	17.3-18.3	77.25-79.43	58.63*	2.55-4.29	7.00 - 7.50
Murex adustus Lamarck	Okha, Nora Island	74-85	115-140	53.2-82.6	3.5-5.3	71.19-71.30	70.88-72.63	2.20	6.65

Thais carinifera (Lamarck)	Poshetra	50-60	88-105	21.0-34.0	9.3-12.7	73.89	66.50	1.94	9.70
T. rudolphi (Lamarck)	Okha. Baida Island	60-105	100-135	38.0-115.8	6.5-8.4	68.49-73.05	72.63-79.63	1.24-1.31	9.25-11.80
Xancus pyrum (Linn.)	Baida Island	165-190	225-275	505.0-699.1	14.2-15.0	70.00-72.64	72.63-77.83	2.96-5.18	9.70-11.80
Telescopium Telescopium (Linn.)	Sikha	75-110	118-135	46.0-104.0	8.9-10.1	75.04-75.53	72.28	4.43	12.35
Tibia curta (Sowerby)	Off Dwarka fishing ground+	115-166	105-141	50.0-116.0	6.7-10.5	73.50-77.30	65.75-66.75	1.60	6.75-8.00
Bursa spinosa (Lamarck)	Off Dwarka fishing ground °°	70-77	90-99	—	—	80.21	76.13	1.74	13.95
Tonna dolium L.	-do-	72	130	27.6	34.8	73.05	77.88	2.20	8.00
Pyrula ficus L.	-do-	82	103	27.7	54.8	75.25	72.63	2.75	9.05
Cypraea sp.	Okha	—	—	—	—	71.37-72.64	64.40-*64.75	1.55-1.81	17.20-20.00

Note:— 1. *All soft tissues were taken for the estimation.

2. Okha (Lat. 22°28′N Long. 69°05′E), Poshetra (Lat. 22°25′N Long. 69°12′E), Chusna Island (Lat. 22°25′N Long. 69°16′E), Balapur (Lat. 22°27′N Long. 69°08′E), Aramda (Lat. 22°26′N Long. 69°02′E), Adatra (Lat. 22°27′N Long. 69.04′E), Nora Island (Lat. 22°31′N Long. 69°20′E), Baida Island (Lat. 22°28′N Long. 69°19′E), Sikka (Lat. 22°27′N Long. 69°51′E), Off Dwarka fishing ground+ (Lat. 22°23′N Long. 68°23′E) Off Dwarka fishing ground °° (Lat. 22°15′N Long. 68°45′E).

TABLE II

SEASONAL VARIATION IN THE COMPOSITION OF *Thais Rugosa* (BORN)

Seasons	Range mm. Length	Circum-ference	Total weight with shell g.	Shell%	Meat% (on total wt.)	Moisture%	Protein (%	Salt (as NaCl) D. W. B.)	Ash
Pre-monsoon February '75 to May '75	42-85	65-145	11.0-117.5	77.7-83.5	5.0-11.1	70.00-72.56	68.25-71.75	2.38-4.67	8.05-10.25
Monsoon July '75 to September '75	44-82	66-150	16.1-73.0	79.9-80.6	6 9-11.1	71.41-75.28	62.30-69.13	1.77-3.09	11 0-13.60
Post-monsoon November '75 to January '76	36-55	52-90	8.0-24.0	77.9-80.5	5.4-12.5	73.02-75.54	65.63-74.38	1.48-3.08	7.60-10.10
Mean	54	93	29.1	80.1	8.6	72.72	68.64	2.66	9.97

in an air-tight screwcap plastic specimen tube for estimation of protein, salt and ash. Total nitrogen was estimated by micro-Kjeldahl method (Vogel, 1961) and nitrogen value multiplied by the factor 6.25 for protein.

Results And Discussion

Table I shows composition of *Ischnochiton* sp. and eighteen species of gastropod while Table II presents seasonal variation in percentage composition of moisture, protein, salt and ash contents of *Thais rugosa*. The physical characteristics give some idea about the size and weight of species taken up for analysis. Shell percentage was determined in *Thais rugosa* only by weighing the shells separated. It was found to be between 77.7 - 83.5 % (Table II). Generally percentage of meat obtained from different species varied between 3.5 - 31. 7% even though it was as high as 34.8 % and 54.8% in the case of *Tonna dolium* and *Pyrulla ficus* respectively.

The analytical data indicate wide variations in the moisture, protein, salt and ash contents among different species. The moisture contents in general varied between 70.0 - 81.6% even though it was as low as 68.49% in the case of *Thais rudolphi* and as high as 86.3 % in the case of *Onchidium verruculatum*.

Protein contents in general fluctuated between 66 - 79.6%. It was less than 65% in case where whole soft body was used for analysis. The salt and ash contents, in general, were found to be between 1.5 - 5.18% and 7-14% respectively even though in rare cases these were as high as 6.84 - 8.21% and 17.20 - 20%. Thus almost all gastropoda showed higher ash percentages. Protein contents are higher than those reported by Ansell *et al.* (1973) in most of the cases when the meat used for the estimation was after removing the digestive system. Protein in *Xancus pyrum* is higher compared to that reported by Venkataraman *et al.* (1953).

During the course of this investigation, it was found that water and salt contents increased and decreased respectively from pre-monsoon to post-monsoon period (Table II). Protein was relatively high during pre-monsoon and post-monsoon periods, whereas it was low during monsoon. On the other hand, ash content was high during monsoon, while it was low during pre-monsoon and post-monsoon periods. Protein and ash contents exhibited inverse relation in *Thais rugosa*.

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