

## VARIATIONS IN BIOCHEMICAL COMPOSITION OF THE GREEN MUSSEL *PERNA VIRIDIS* LINNAEUS OF ENNORE ESTUARY, MADRAS\*

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### ABSTRACT

- Seasonal changes in the biochemical composition of intertidal green mussels, *Perna viridis* Linnaeus from Ennore estuary, Madras were studied during the year 1974. Three peak caloric values (5.638, 5.724 and 5.675 kcal/g ash free) corresponding to three peak protein values (68.00, 68.02 and 65.00% of dry body weight) were noted in mature mussels during the months of March, June and August respectively. The immature mussels exhibited higher values of carbohydrate (29.30, 29.15 and 28.15% of dry body weight) during July, August and September and lower values (19.80, 20.70 and 19.35%) during the monsoon periods of October, December and January. The yearly average caloric values of 5.432 kcal/g for mature mussels and 5.330 kcal/g for immature mussels were considered as mean values for this population. -

Only recently, after the importance of mussel culture in India had been realised, studies on the utilisation or storage of food reserves in the green mussel, *Perna viridis* Linnaeus began to receive considerable attention (Qasim, Parulekar, Harkantra, Ansari and Nair, 1977). Wafar, Sumitra-Vijayaraghavan and Krishnakumari (1976) have studied the seasonal changes in the nutritive values of these green mussels from the intertidal regions of Goa and noted that such variations were due to seasonal changes in total carbon and lipid contents in association with the spawning cycle. Variations in the biochemical composition of mussels have also been reported from Ratnagiri area (Nagabushanam and Mane, 1978). Seasonal changes in caloric values directly affect productivity and standing crop estimates of field populations. *P. viridis* occur in dense population at Ennore estuary, Madras, playing a major role in the function of this estuarine ecosystems. The present paper dealing with the variations in the total protein, carbohydrates, lipid, ash and caloric contents of these green mussels from this estuary may be of help in studying ecological energy models.

*Preparation of materials:* Animals for analysis were collected from Ennore estuary, Madras at more or less monthly intervals during the year 1974. Individual animals were separated from clumps and cleaned in sea water. The mussels measuring 10 to 40 mm were considered as immature mussels and those measuring 75 to 100 mm were grouped as mature mussels (Shafee, 1977). For each group, 10 mussels were selected and placed in sea water to defaecate for two days. The soft parts of the mussels were extracted, drained, homogenised and dried in an air oven at 60°C. The dried flesh was ground

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to a fine powder and kept in dry stoppered small glass tubes in a desiccator for further biochemical analysis. Since the quantity of dry matter from the immature mussels was too small, the samples of each month were pooled together, ground up and divided into five groups. All analyses were carried out on each of these five groups and the results are expressed as a mean level (percentage of dry body weight). The mature animals were treated individually for all analyses and the mean level for each month expressed as mentioned above.

**Biochemical analysis:** Lipid was estimated by the method described by Barnes, Barnes and Finlayson (1963) with small modifications as suggested by Williams (1969). Total nitrogen was estimated by a standard Kjeldahl procedure and the percentage of protein was obtained on multiplication by the conventional factor 6.25. The percentage of ash contents was estimated by burning the material in a muffle furnace at 550°C for 24 hrs. Total carbohydrate of the mussel bodies was estimated using the methods of Mendel, Kemp and Myers (1954).

**Calorimetry:** The total caloric content (kcal/g ash free dry weight) of mussel bodies was determined by a Russian bomb calorimeter (available at Neyveli Lignite Corporation, Neyveli, India)

The mean caloric values of each sample (mature and immature) were expressed with their 95% confidence intervals. These experimental values were checked against the calculated values from the total organic content of each sample and the differences were found to be insignificant. Caloric contents were calculated from the biochemical composition using the following factors: Protein 5.65, Lipids 9.45, (Winberg, 1971) and carbohydrate 4.2 (Dare and Edwards, 1975).

The results of the biochemical analyses expressed as percentage of dry weight for the mature and immature mussels are given in Table I and Table II respectively.

**Table I.** Biochemical composition and caloric values of the dry flesh of 75 to 100 mm (mature) inter-tidal *Perna viridis* L. in the Ennore estuary, Madras during the year 1974.

Date of collection	Composition (as % dry weight)				Cal. values (ash free) kcal/g+95 %C. I. (n)
	Protein	Carbohydrate	Lipids	Ash	
23.01.1974	60.20	23.40	5.60	10.80	5.332±0.231 (10)
23.02.1974	61.85	19.03	6.96	12.16	5.343±0.112 (10)
18.03.1974	68.00	9.95	6.30	15.75	5.638±0.197 (10)
15.04.1974	52.00	33.80	4.65	9.50	5.084±0.222 (10)
24.05.1974	59.95	20.35	6.40	13.60	5.381±0.178 (10)
26.06.1974	68.02	11.00	5.80	15.20	5.724±0.127 (10)
27.07.1974	52.25	32.55	5.45	9.75	5.123±0.244 (10)
22.08.1974	65.00	14.90	6.30	13.80	5.675±0.221 (10)
15.09.1974	52.35	32.15	5.40	10.10	5.026±0.248 (10)
14.10.1974	55.35	28.15	6.25	10.25	5.187±0.123 (10)
12.11.1974	57.25	24.65	7.50	10.60	5.282±0.195 (10)
13.12.1974	58.90	23.85	7.00	10.25	5.314±0.224 (10)
Yearly average	59.26	22.81	6.13	11.81	5.432

Table II Biochemical composition and caloric values of the dry flesh of 10 to 40 mm (immature) inter-tidal *Perna viridis* L. in the Ennore Estuary, Madras during the year 1974.

Date of collection	Components (as % dry weight)				Cal. values (ash free) kcal/g $\pm$ 95% C. I. (n)
	Protein	Carbohydrate	Lipids	Ash	
03.01.1974	60.95	19.35	6.40	13.60	5.420 $\pm$ 0.278 (5)
30.04.1974	58.20	24.55	7.00	10.25	5.340 $\pm$ 0.342 (5)
17.07.1974	54.50	29.30	6.65	9.50	5.290 $\pm$ 0.187 (5)
28.08.1974	54.35	29.15	6.40	10.10	5.290 $\pm$ 0.312 (5)
29.09.1974	55.35	28.15	6.25	10.25	5.250 $\pm$ 0.412 (5)
23.10.1974	61.22	19.80	6.20	12.78	5.330 $\pm$ 0.325 (5)
17.12.1974	60.06	20.70	6.90	12.34	5.420 $\pm$ 0.199 (5)
Yearly average	57.80	24.42	6.54	11.25	5.330

The caloric values of dry bodies of mature mussels showed three maximum values in association with the high protein values (Table I), during the month of March, June and August. The immature mussels showed no appreciable seasonal fluctuations in their caloric content throughout the year (Table II). The yearly average caloric values for mature and immature mussels were 5.342 and 5.330 kcal/gm ash free dry weight respectively.

The mussels from Ratnagiri were reported to have two peak spawning periods, one in July to September and another in February to March (Nagabushanam and Mane, 1975). Consequently, they also showed two peak values of total protein and lipid contents during prespawning periods when the percentage of glycogen had already started falling (Nagabushanam and Mane, 1978). The breeding seasons of these mussels at Goa extend from July to April and hence the higher caloric values and lipid fractions noticed during the months of April to August were assumed to be due to prespawning conditions (Wafar, Sumitra-Vijayaraghavan and Krishnakumari, 1976) and the lower values of lipid content during the months of August to December due to post-spawning periods (Qasim, Parulekar, Harkantra, Ansari and Nair, 1977). In this study, no experimental work was performed to verify whether or not the storage and utilisations of energies were dependent upon sexual cycles. In tropical animals, the biochemical cycles of one population need not necessarily be synchronised with another. Even in the same population, a sample may contain animals with a range of different stages. Under these circumstances the mean values obtained in this study may reflect the population of animals in different conditions, and the resulting seasonal pattern may be essentially meaningless or at least not capable of further interpretations in terms of utilisation or storage of reserves or spawning. The mean values obtained in this study may only be considered as average values of this population since seasonal observations of the absolute biochemical contents of different parts of the mussels have not been followed.

The average caloric values of mature and immature *Perna viridis* seem to be a little higher than the reported values of green mussels from intertidal waters of Goa (Wafar, Sumitra-Vijayaraghavan and Krishnakumari, 1976), but are in accordance with other tropical bivalves reported by these authors and also with the findings of Qasim Parulekar, Harkantra, Ansari and Nair (1977).

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