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33. SEASONAL VARIATIONS IN THE BIOCHEMICAL COMPOSITION OF *MERETRIX CASTA* (CHEMNITZ) OCCURRING IN VELLAR ESTUARY

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ABSTRACT

Seasonal variation in biochemical composition of *Meretrix casta* (Chemnitz) occurring in Vellar estuary (Lat. 11°29' N; Long 79°46' E), S. India was carried out monthly for a period of one year from April '75 to March '76.

Gonad recorded high percentage of carbohydrates (5.2%-9.4%) than the other body components (viz- mantle, adductor muscle, gills, foot, siphon and digestive gland). Gonad also recorded the highest protein value of 74.4% but mean monthly values showed that mantle had higher percentage of protein (60.5%) than other body components.

Digestive gland had high percentage of lipid (mean 3.05%) than the other body components. Digestive gland appears to be storage organs for fat and protein. Of the seven body components studied, gill showed very low percentage of protein (47.07%), carbohydrate (1.45%) and fat (1.73%).

Protein content of gonad registered an increase before spawning and decrease after spawning. Thus, protein content of gonad showed seasonal changes associated with the annual reproductive cycle.

INTRODUCTION

Biochemical composition of bivalves were studied by several workers in India (Venkataraman and Chari 1951; Durve and Bal 1961; Joshi and Bal 1965; Kasinathan 1963, '64a, b, '67; Rahaman 1965, '66; Saraswathi and Nair 1969; Nagabushanam and Deshmukh 1974; Wafer 1974; George and Nair 1975; Salih 1979; John 1980; Lakshmanan and Nambisan 1980; Jayabal and Kalyani 1986). The seasonal changes in biochemical composition of body components viz. mantle, adductor muscle, foot, gill, gonad, siphon and digestive gland in *Meretrix casta* (Chemnitz) were studied from April 1975 to March 1976 and the results are presented

MATERIAL AND METHODS

From the Vellar estuary 20 to 25 mature specimens of *M. casta* in size between 28-30mm were collected monthly and adopting standard procedure and precautions, biochemical estimations were carried out on dried tissues of the whole animal and other body components. Five estimations were done in each case and the average was taken. Protein was estimated employing Biuret method of Raymond et al (1964) while the procedure of Dubois et al

(1956) was followed for determining the total carbohydrate content- Chloroform-Methanol extraction method of Foich et al (1956) was adopted for the estimation of lipid content of the tissues.

OBSERVATIONS

^ protein

Protein content varied from 50.4 to 63% for the whole animal (Table 1). The highest value occurred in May while the lowest value in November and December. High protein values recorded in May and August could be correlated to the intense breeding activity of the clams during these months

Protein in the gonad tissue varied between 50.4 and 74.4%, Highest value observed in April could be due to intense proliferation of gonad and low value in May due to spawning activity. Another peak value in August (70.8%) coincided with secondary peak of breeding activity and low values in subsequent month due to spawning.

Protein in mantle tissue varied from 49.2 to 67.2% but mean monthly values showed higher percentage of protein (60.5%) than gonad. In

TABLE 1. Seasonal variation in protein level (%) in the whole animal and different body components of *Meretrix casta* for the year 1975-16.

| Month | | Whole animal | Gonad | Mantle | Adductor muscle | Digestive gland | Foot | Gill | Siphon |
|-------|------|--------------|-------|--------|-----------------|-----------------|------|------|--------|
| Apr | 1975 | 54.6 | 74.4 | 57.6 | 54.0 | 50.4 | 46.8 | 45.6 | 43.2 |
| May | | 63.0 | 50.4 | 67.2 | 55.2 | 51.6 | 49.2 | 46.8 | 46.8 |
| Jun | | 56.4 | 52.8 | 62.4 | 60.6 | 57.6 | 58.8 | 45.6 | 52.8 |
| Jul | | 54.0 | 61.2 | 64.8 | 62.4 | 49.2 | 56.4 | 54.0 | 44.4 |
| Aug | | 61.2 | 70.8 | 66.0 | 58.8 | 63.6 | 49.2 | 46.8 | 48.0 |
| Sep | | 60.0 | 51.6 | 68.8 | 52.8 | 62.4 | 48.0 | 50.4 | 45.0 |
| Oct | | 54.0 | 52.8 | 63.6 | 61.2 | 52.8 | 62.8 | 44.4 | 45.6 |
| Nov | | 50.4 | 51.6 | 52.8 | 58.8 | 51.6 | 51.6 | 43.2 | 46.8 |
| Dec | | 50.4 | 52.8 | 49.2 | 54.0 | 54.0 | 51.6 | 43.2 | 45.6 |
| Jan | 1976 | 57.6 | 55.2 | 58.8 | 56.4 | 58.8 | 52.8 | 48.0 | 49.2 |
| Feb | | 60.0 | 64.8 | 61.2 | 60.0 | 55.2 | 54.0 | 50.4 | 46.8 |
| Mar | | 56.4 | 70.8 | 63.6 | 58.8 | 62.4 | 51.6 | 45.6 | 50.4 |
| Mean | | 56.5 | 59.1 | 60.5 | 57.8 | 55.8 | 51.9 | 47.0 | 47.0 |
| S. D. | | 3.88 | 8.50 | 5.15 | 3.04 | 4.84 | 3.29 | 3.09 | 2.59 |

mantle, during the dry season (January to July) when there was active feeding and synthesis, the protein values were more. During monsoon (October to December), when food becomes scarce, protein values were low.

Protein value varied from 52.8 to 62.4% in adductor muscle and from 49.2% to 63.6% in digestive gland. In adductor muscle, highest value was recorded in July and lowest in September. In digestive gland, highest value occurred in August and lowest in July. No definite trend in protein values could be seen in these two body components.

Protein content ranged from 46.8 to 58.86% in foot and from 43.2 to 54.0% in gill. During breeding peaks and monsoon periods, the values were lower and there was a subsequent build up later in these tissues. Siphon registered low protein values ranging from 43.2 to 52.8% and did not show any specific trend.

b. Carbohydrate

Carbohydrate content of the whole animal ranged from 3.6 to 6.8% in different months (Table 2). The values were low during monsoon months and high in other months- Carbohydrate content of gonad varied from 5.2 to 9.4%. Highest value was observed in May and the

lowest in June. During the primary peak of breeding activity (April-May) the values were higher and immediately after there was a decrease in June. Later there was a build up with secondary breeding peak. Then again the values declined during the monsoon period.

Carbohydrate content ranged from 2.2 to 5.6% in digestive gland, from 2.1 to 4.5% in mantle and from 1.5 to 3.4% in adductor muscle during different months. Highest value was observed in May and the lowest in November and December. High carbohydrate value in May could be correlated to intense breeding activity and the values declined during the monsoon months.

Carbohydrate content varied from 2.1 to 3.4% in siphon, 1.3 to 2.5% in foot and 1.0 to 2.1% in gill. Gill recorded the lowest amount of carbohydrate and the values did not show any trend.

c. Lipid

Lipid content of the whole animal was generally low and the values varied from 2.0 to 5.2% in different months (Table 3). Higher values observed in April-May could be correlated with primary breeding peak. After this intense period of breeding, the values declined.

TABLE 2. Seasonal variation in carbohydrate level (%) in the whole animal and different body components of *Meretrix casta* for the year 1975-76

| Month | | Whole animal | Gonad | Mantle | Adductor muscle | Digestive gland | Foot | Gill | Siphon |
|-------|------|--------------|-------|--------|-----------------|-----------------|------|------|--------|
| Apr | 1975 | 5.00 | 8.10 | 3.70 | 2.70 | 4.10 | 2.50 | 1.30 | 3.00 |
| May | | 6.80 | 9.40 | 4.50 | 3.40 | 5.50 | 1.80 | 1.10 | 3.40 |
| Jun | | 4.40 | 5.20 | 2.70 | 2.40 | 3.00 | 1.80 | 2.10 | 3.10 |
| Jul | | 4.20 | 6.00 | 3.80 | 3.00 | 3.60 | 2.30 | 1.90 | 3.30 |
| Aug | | 4.20 | 6.80 | 4.10 | 2.90 | 3.80 | 1.80 | 1.40 | 2.90 |
| Sep | | 4.20 | 6.80 | 3.80 | 3.00 | 3.40 | 2.10 | 1.60 | 2.50 |
| Oct | | 4.10 | 6.20 | 3.40 | 2.00 | 3.50 | 1.30 | 1.20 | 3.00 |
| Nov | | 3.80 | 6.00 | 3.20 | 2.00 | 2.20 | 1.70 | 1.00 | 2.40 |
| Dec | | 3.60 | 6.00 | 2.10 | 1.50 | 3.30 | 1.50 | 1.30 | 2.70 |
| Jan | 1976 | 4.80 | 7.90 | 2.40 | 2.40 | 3.60 | 1.30 | 1.50 | 2.10 |
| Feb | | 4.90 | 8.00 | 3.10 | 2.60 | 3.60 | 1.70 | 1.70 | 2.80 |
| Mar | | 5.00 | 8.20 | 3.80 | 2.80 | 3.80 | 1.90 | 1.30 | 3.00 |
| Mean | | 4.59 | 7.06 | 3.38 | 2.56 | 3.62 | 1.81 | 1.45 | 2.85 |
| S. D. | | 0.77 | 1.19 | 0.68 | 0.51 | 0.73 | 0.35 | 0.31 | 0.36 |

TABLE 3. Seasonal variation in lipid level (%) in the whole animal and in different body components in *Meretrix casta* for the year 1975-76

| Month | | Whole animal | Gonad | Mantle | Adductor muscle | Digestive gland | Foot | Gill | Siphon |
|-------|------|--------------|-------|--------|-----------------|-----------------|------|------|--------|
| Apr | 1975 | 4.60 | 3.60 | 2.50 | 2.00 | 4.40 | 2.50 | 2.30 | 2.00 |
| May | | 5.20 | 4.50 | 3.20 | 2.10 | 4.00 | 2.30 | 2.10 | 2.30 |
| June | | 3.80 | 2.50 | 2.70 | 2.10 | 3.80 | 2.70 | 2.50 | 2.50 |
| Jul | | 3.20 | 2.70 | 2.70 | 2.00 | 2.80 | 2.40 | 1.80 | 2.00 |
| Aug | | 3.00 | 2.60 | 2.80 | 1.80 | 3.00 | 2.70 | 1.60 | 1.80 |
| Sep | | 2.60 | 2.70 | 2.50 | 1.90 | 3.20 | 2.10 | 1.80 | 1.70 |
| Oct | | 2.20 | 2.50 | 2.00 | 2.00 | 2.60 | 1.80 | 1.20 | 2.00 |
| Nov | | 2.00 | 2.30 | 1.80 | 1.40 | 2.40 | 1.90 | 1.00 | 2.10 |
| Dec | | 2.00 | 2.50 | 2.00 | 1.50 | 2.20 | 2.00 | 1.50 | 1.80 |
| Jan | 1976 | 2.00 | 3.60 | 2.70 | 1.70 | 2.60 | 2.50 | 1.50 | 1.70 |
| Feb | | 2.20 | 2.70 | 2.50 | 2.00 | 2.80 | 2.10 | 1.80 | 1.90 |
| Mar | | 2.80 | 3.00 | 3.00 | 2.10 | 2.80 | 2.40 | 1.60 | 2.10 |
| Mean | | 2.97 | 2.85 | 2.53 | 1.88 | 3.05 | 2.31 | 1.73 | 1.99 |
| S. D. | | 1.02 | 0.59 | 0.40 | 0.23 | 0.65 | 0.28 | 0.41 | 0.23 |

Lipid content varied from 2.3 to 4.5% in gonad, from 1.8 to 3.2% in mantle from 1.4 to 2.1% in adductor muscle and from 2.2 to 4.4 in digestive gland. Digestive gland had high

percentage of lipid content (mean 3.05%) than other body components. The values were higher during intense breeding months and subsequently there was a decline.

The Variation in lipid content was between 1.8 and 2.7% in foot, 1.0 and 2.5% in gill and 1.7 to 2.5% in siphon. The values did not show any trend.

DISCUSSION

Ansell et al (1964) in *Venus mercenaria* and Giese (1969) in *Tivela stultorum* reported that biochemical composition did not show any seasonal change and varied considerably at different times during the year. Ansell et al (1964) reported that gonad and digestive gland had greater percentage of carbohydrate and fat while Giese (1969) found high carbohydrate content in gonad and high lipid content in digestive gland. Later Ansell (1974 a, b, c) found that protein nitrogen increases to pre-spawning maximum in *Abra abra* and *Lima hians* while lipid and protein nitrogen levels decrease during spawning period.

Durve and Bal (1961) in *Crassostrea gryphoides* Joshi and Bal (1965) in *Katelysia marmorata* and Nagabushanam and Deshmukh (1974) in *Meretrix meretrix* found that glycogen content was related to gonad development and increased during active gametogenesis. Venkataraman and Chari (1951) reported that fat content in *Meretrix casta* increased during gonad development.

Salih (1975) reported that glycogen and protein content showed a steady fall during premonsoon period and an equally steady rise during the postmonsoon period while the trend was opposite in the case of fat. John (1980) noted a decline during spawning period in lipid and protein values in *Anadara rhombea* and stated that the digestive gland served as a storage organ of fat. Lakshmanan and Nambisan (1980) observed a significant negative correlation between carbohydrate and protein in *Villo-rita cyprinoides* var. *cochinensis* and *Meretrix casta*.

In the present study high percentage of protein was found in the mantle than in any other organ. Further, it was found that gonad and digestive gland had respectively high percentage of carbohydrate and fat than other

organs. Ansell et al. (1964) also reported that gonad and digestive gland showed respectively high percentage of carbohydrate and fat than any other organ. As reported by John (1980) in *Anadara rhombea* digestive gland may be serving as a storage organ of fat in *id casta* also.

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