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SOME ASPECTS OF BIOLOGY AND BIOCHEMISTRY OF THE BACKWATER CLAM, *MERETRIX CASTA* (CHEMNITZ)

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ABSTRACT

Studies on the changes in the biochemical constituents and energy values of the backwater clam *Meretrix casta* have been carried out in relation to some aspects of its biology. Despite the sexual differences, there seems to be no significant difference in the biochemical constituents. Mean values of calories and lipids irrespective of sex were 4.1 kcal/g ash-free dry weight and 10.51% respectively. The percentage edibility was found to vary between 11.26 and 12.08, whereas, the condition index ranged from 2.8 to 3.56%. Compared with premonsoon and postmonsoon the values of calories and protein were found to be higher during monsoon. Suitable periods for harvesting these clams and culture possibilities have been indicated.

Dense clam beds of *Meretrix casta* (Chemnitz) occur in the estuaries and backwaters of Goa. The meat of this clam is a cheap source of protein food which is in great demand in the markets of Goa and is available almost throughout the year. Biological aspects of this species from the West Coast has been reported by Parulekar, Dwivedi and Dhargalkar (1973) and Harkantra (1975). Recently Sumitra–Vijayaraghavan, Wafar, Jacob, Balasubramanian, Rajagopal and Krishna Kumari (1975) have given an account of caloric values of bivalves. In the present communication, a year long study has been made on the changes in the biochemical constituents and energy values of this clam. This information along with the available information on the ecology and biology of these clams will be of importance in initiating mass culture practice and also in the proper utilization of clam resources.

Marketed samples were collected fortnightly for a period of one year from September 1974 to August 1975 and were kept in sea water for some time in order to ensure that they are alive and also to clean them of their faeces. Whole weights and meat weights were taken after blotting them to remove outside moisture. Clams were differentiated into male, female and indeterminate ones after examining the gonad smears under microscope and their percentage worked out. The soft parts were dried at 70°C in an oven and the dried samples were homogenized and preserved for further chemical analysis. Condition index was determined as a ratio of the dry meat weight to dry shell weight. Percentage edibility was determined as a ratio of the wet weight to the whole weight of the animal. Organic carbon was estimated according to the method described by Qasim and Jacob (1972). Lipid was estimated by methanol–chloroform method of Folch and Stanley (1956). Carbohydrate was estimated colorimetrically using phenol

sulphuric acid reagents (Dubois, Gilles, Hamilton, Rebus and Smith, 1956) and the total protein was estimated by Biuret method (Raymont, Austin and Lingford, 1964). Ashing was done at 600 °C in a muffle furnace. From the biochemical constituents caloric values were calculated using the conversion factors given by Prosser and Brown (1961).

The percentage edibility of *M. casta* ranges from 11.26 to 12.08. Similarly the condition index ranges from 2.8 to 3.56. Table I shows monthwise percentage edibility and condition index of *M. casta*. Percentage edibility of *M. casta* collected from fish farm at Mandapam ranges from 4.22 to 5.98 (Durve, 1964). Similarly percentage edibility of *M. casta* from Madras coast ranges from 5 to 16 (Venkataraman and Chari, 1951). But as reported by Durve (1964) we have also not observed any particular difference in any of the months.

The percentage of male, female and indeterminate ones are found to be almost equal during September and October. Male and female ones are seen almost throughout the year with a majority of them occurring from November to April (Fig. 1). Spawning appears to occur throughout the year with a slightly high level during March–April.

Table I. Showing month-wise percentage edibility, condition index and water content of *M. casta*.

Months		Percentage edibility	Condition index	Water content
September	'74	11.88	2.99	78.65
October	,,	11.71	2.92	78.79
November	,,	12.06	2.81	80.02
December	,,	11.66	3.21	76.98
January	'75	11.45	3.38	75.64
February	,,	11.37	3.51	74.63
March	,,	12.08	2.80	80.22
April	,,	11.69	3.19	77.23
May	,,	11.26	3.54	73.69
June	,,	11.38	3.49	74.69
July	,,	11.31	3.56	74.17
August	,,	11.44	3.43	75.24

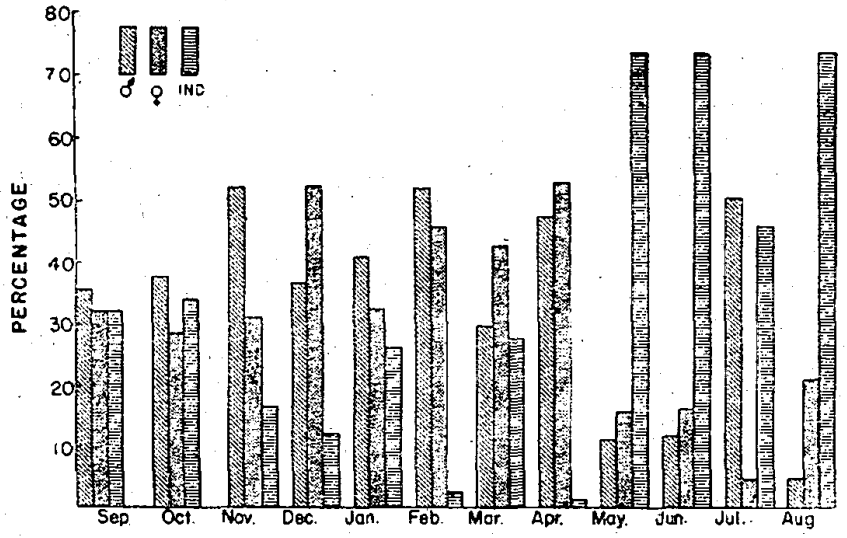

Fig. 1. Histogram showing percentage composition of male, female and indeterminate ones in *M. casta*.

This is evidenced by the sudden appearence of indeterminate ones in greater numbers during May – August period. Male and female clams continue to appear in different numbers from November to March, as also observed by Durve (1964).

Figs. 2, 3 and 4 give monthwise variations in biochemical composition of male, female and indeterminate specimens. In male, the caloric value ranges from 3.8 to 5.1 kcal/g ash-free dry weight, carbon 27.2 to 41.1%, carbohydrate 2.9 to 14%, lipid 5.3 to 19.1%, protein 67.1 to 82.9%, ash 1.5 to 11.2% and water content 71.9 to 83.9% (Fig. 2).

In female the caloric value ranges from 3.6 to 4.6 kcal/g ash – free dry weight, carbon 24.19 to 36.7%, carbohydrate 3.8 to 10.8%, lipid 4.3 to 15.2%, protein 65.3 to 82.4%, ash 2.4 to 9.9% and water content 71.2 to 85.2% (Fig. 3).

In indeterminate forms the caloric values ranges from 3.2 to 4.7 kcal/g ash-free dry weight, Carbon 24.0 to 37.3%, carbohydrate 1.9 to 12.4%, lipid 5.5 to 14.5%, protein 66.4 to 80.7%, ash 1.93 to 12.2% and water content 74.6 to 85% (Fig 4).

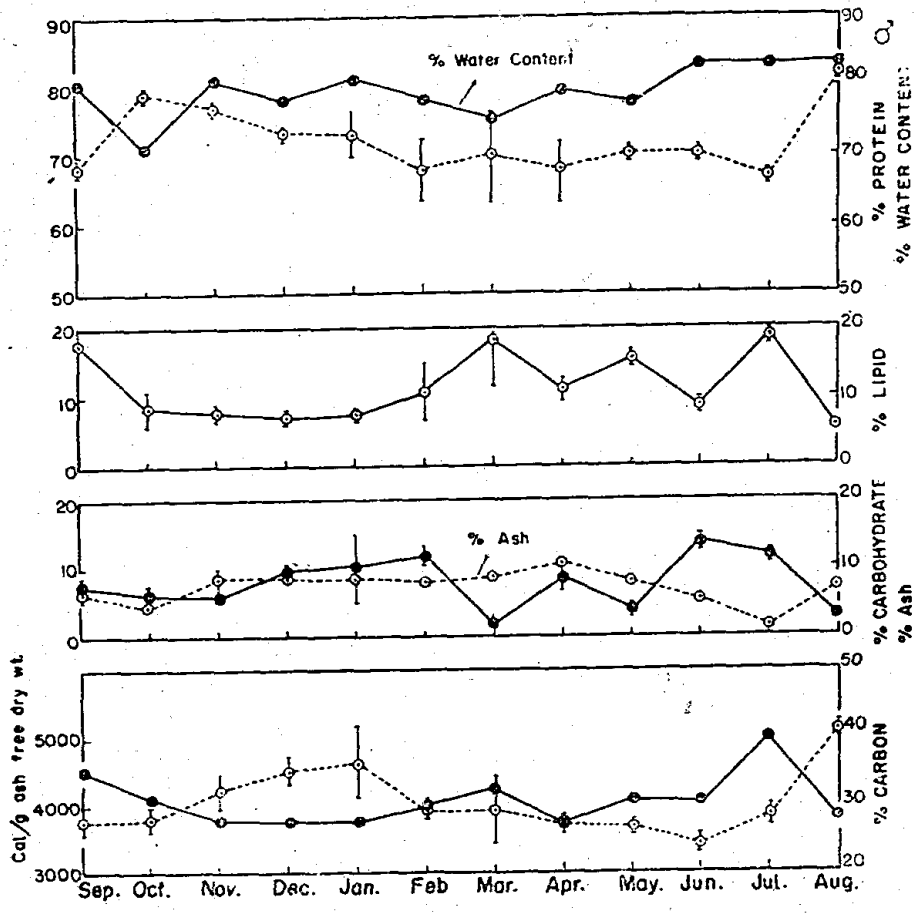

Fig. 2. Graph showing monthly variation in biochemical composition of *M. casta* (male).

Despite the sexual difference there seems to be no significant difference in the caloric values. On an average *M. casta* has 4·1 kcal/g ash-free dry weight, carbon 30·08%, Lipid 10·51%, carbohydrate 8·19%, ash 7%, protein 73·98% and water content 79·52%.

Little is known as far as the biochemical composition of the clams from the Indian coasts is concerned. Great amount of work has been carried out by Ansell, Sivadas and Narayanan (1973) on different species of *Donax* along South West India and by Ansell (1974 *a–d*) on bivalves of the Clyde Sea area. Table II shows the range of values of biochemical composition irrespective of sex on different species of bivalves along with those of *M. casta* based on present work. Caloric and lipid values shows a higher level in *M. casta* than in the different species of *Donax*. Mean values of calories and lipid in *M. casta* based on present work are close to the values reported by Ansell, Sivadas and Narayanan (1973) and Ansell (1974 *a–d*) although the method employed differs. Absence of significant biochemical variation may probably be related to the continuous breeding habit of the clam *M. casta*. Caloric value of

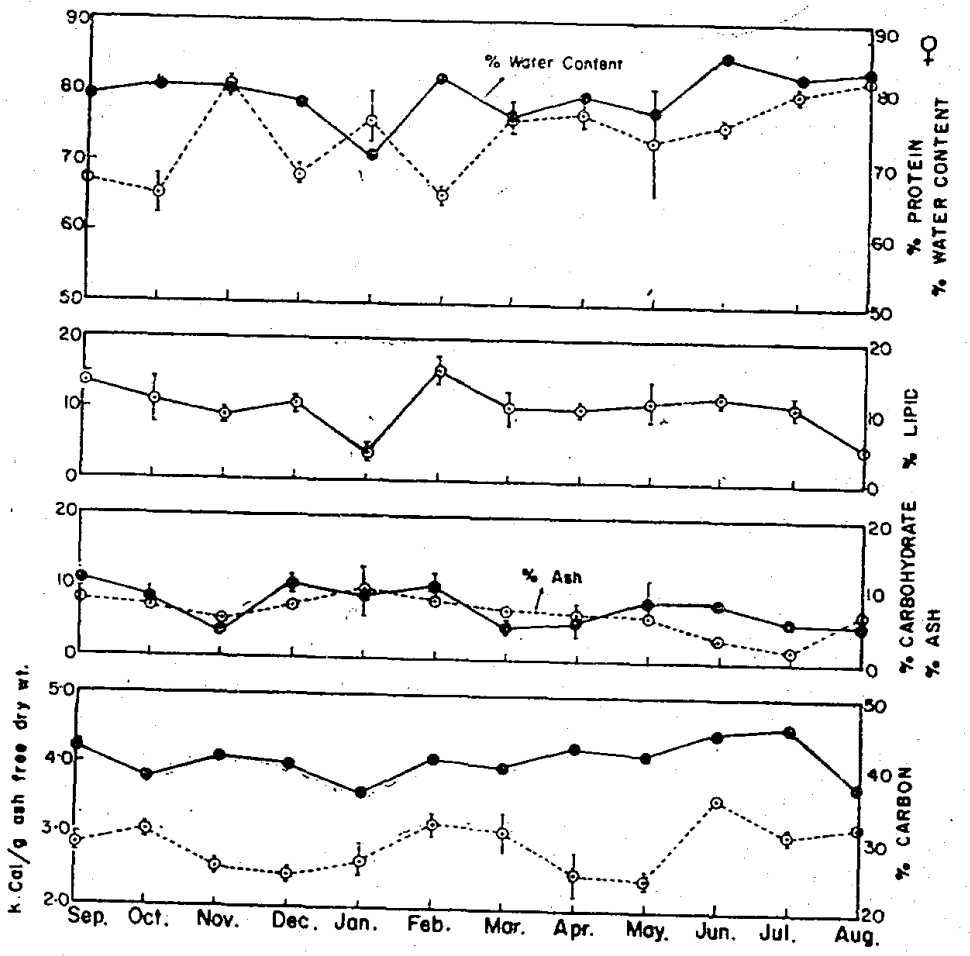

Fig. 3. Graph showing monthly variation in biochemical composition of *M. casta* (female).

4.4 kcal/g ash-free dry weight and protein 75% are obtained during monsoon. These values when compared with premonsoon and postmonsoon values are higher. This shows that monsoon is the ideal time for harvesting these clams. In fact intensive clam fishery occurs during monsoon in this area when all other fishing activity is suspended. This clam alone contributes about 1/3 of the molluscan catches in this locality (Parulekar, Dwivedi and Dhargalkar, 1973).

Countries like Japan, Thailand, Malayasia and France have already advanced in culturing the clams. The important species cultured are *Tapes japonica* in Japan, *Meretrix meretrix* in Taiwan and *Mya arcenaria* in the United States. *M. casta* grows in the fish farm at Central Marine Fisheries Research Institute, Mandapam. The studies of Parulekar, Dwivedi and Dhargalkar (1973) and our present study indicate that the waters of Goa are ideal for culturing this clam. Attempts to culture these organisms will be profitable. The important factors favourable for culture operations are selection of suitable areas for laying of clam beds, conditioning bottom soil, fast growth, and availability of small seed clams

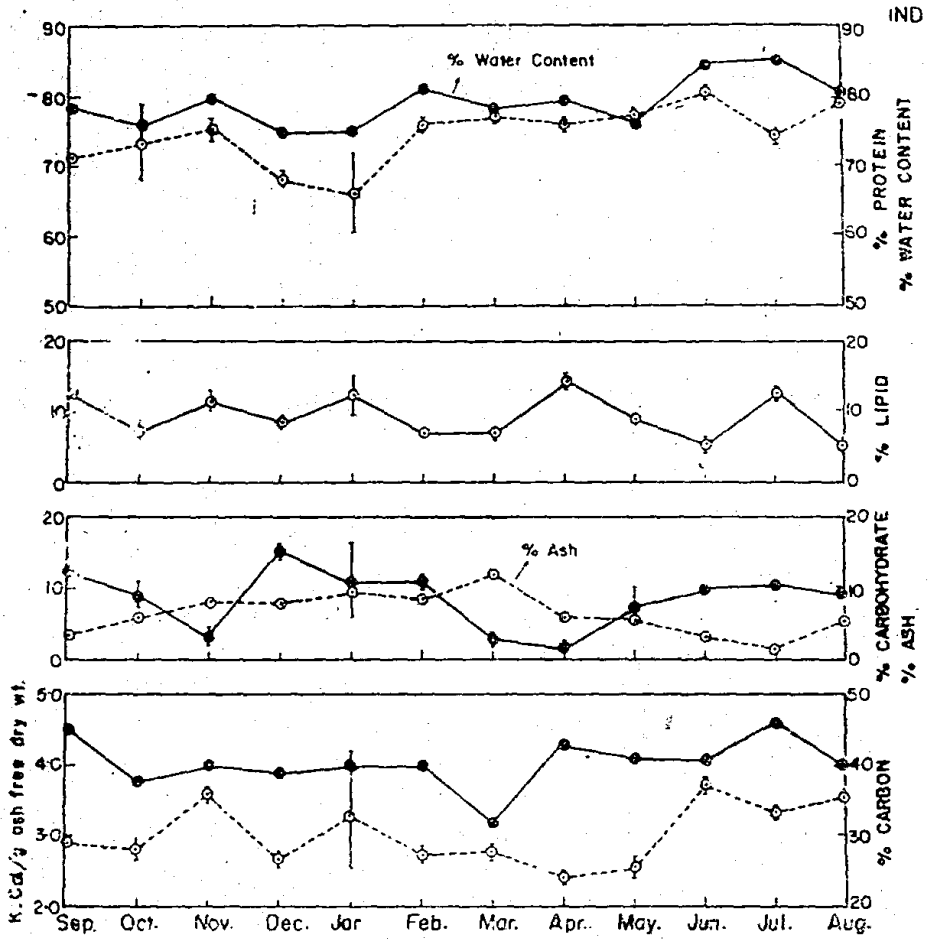

Fig. 4. Graph showing monthly variation in biochemical composition of *M. casta* (indeterminate).

Table II. Proximate composition and energy content in different clams.

Species	Moisture %	Ash %	Lipid %	Carbo-hydrate %	Organic Carbon %	Calories kcal/g dry wt.	Author
Abra alba	79·18 to 87·27	13·51 to 29·62	3·26 to 6·83	8.19 to 17·16	34·12 to 40·08	3·85 to 4.5	Ansell, A. D., 1974*a*
Chlamys septemradiata	76·93 to 91·86	8·16 to 34·53	4.33 to 13·05	3.1 to 7·99	28·77 to 44·60	4·25 to 4·7	Ansell, A. D., 1974*b*
Nucula sulcata	75·95 to 82.14	8·31 to 16·93	4·52 to 8·79	1·98 to 10·24	35·00 to 45·90	3·8 to 5.1	Ansell, A. D., 1974*c*
Lima hians	83·5 to 89·77	12·98 to 24·06	4.91 to 7·69	1.73 to 6·89	35.6 to 40·6	3·8 to 4·7	Ansell, A. D., 1973*d*
Donax incarnatus	78·98 (mean)	15·27 (mean)	4·31 to 4.69	4·59 (mean)	40·97 (mean)	4·25 to 4·53	Ansell, Sivadas & Narayanan, 1973
Donax spiculum	75·38 (mean)	12·55 (mean)	9·3 to 5·27	4.39 (mean)	41.34 (mean)	4·62 to 4.79	Ansell, Sivadas & Narayanan, 1973
Villorita cyprinoides var cochinensis	—	—	2·60 to 8·70	— —	38·3 to 40·5	4·2 to 4·9	Sivankutty Nair, G. and Shynamma, 1975
Meretrix casta	71·16 to 85·23	1.51 to 12·21	4·25 to 19·07	1·92 to 14·03	24·04 to 41·11	3·2* to 5·1	Present work

* Ash free dry weight.

for spreading them on selected beds. Since the clam is a continuous breeder the seed clams can be obtained at any time during the year. Even if the clams from natural beds are exploited to a larger extent at present, the output can still be increased to a high level to cope-up with the increasing demand. With negligible expenditure clam culture along with other molluscs can be very profitably initiated for increasing production.

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