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SEASONAL VARIATIONS IN THE BIOCHEMICAL COMPOSITION OF THE CLAM **TELLINA ANGULATA** FROM BOMBAY

L. KRISHNA KUMARI* AND VIJAYALAKSHMI R. NAIR

Regional Centre, National Institute of Oceanography, Versova, Bombay 400 061.

ABSTRACT

Change in the proximate composition and energy value of the claim **Tellina angulata** were studied for a period of fifteen months from Bombay. Irrespective of sex protein as percentage at dry weight ranged from 39.04 to 75.72, carbohydrate 4.83 to 24. 89, lipid 7.41 to 19.81, carbon 21.99 to 39.89 and ash 4.01 to 27.56. Sexwise protein and lipin were maximum in male and carbohydrate in female. Seasonal variation in the proximate composition of the species was well defined.

INTRODUCTION

Marine molluse especially bivalves are considered as a cheap and nutritive item of food for human consumption due to their ability to accumulate large quantities of glycogen, fat and carbohydrate - the most important energy sources in their soft tissue (Gobbot, 1976). Studies on the proximate metabolite composition of a seafood species helps in understanding its nutritional value. Literature pertaining to this aspect in molluscs from Bombay waters is limited (Durve, 1965; Nagabhushanam and Bidarkar, 1978; Nagabhushanam and Mane, 1978) and practically nothing is known on the clam **Tellina angulata** from Bombay. The present communication represents seasonal and sexwise variation in the biochemical composition of the clam **T. angulata** from Bombay.

* Present address: National Institute of Oceanography, Dona Paula, Goa 403 004.

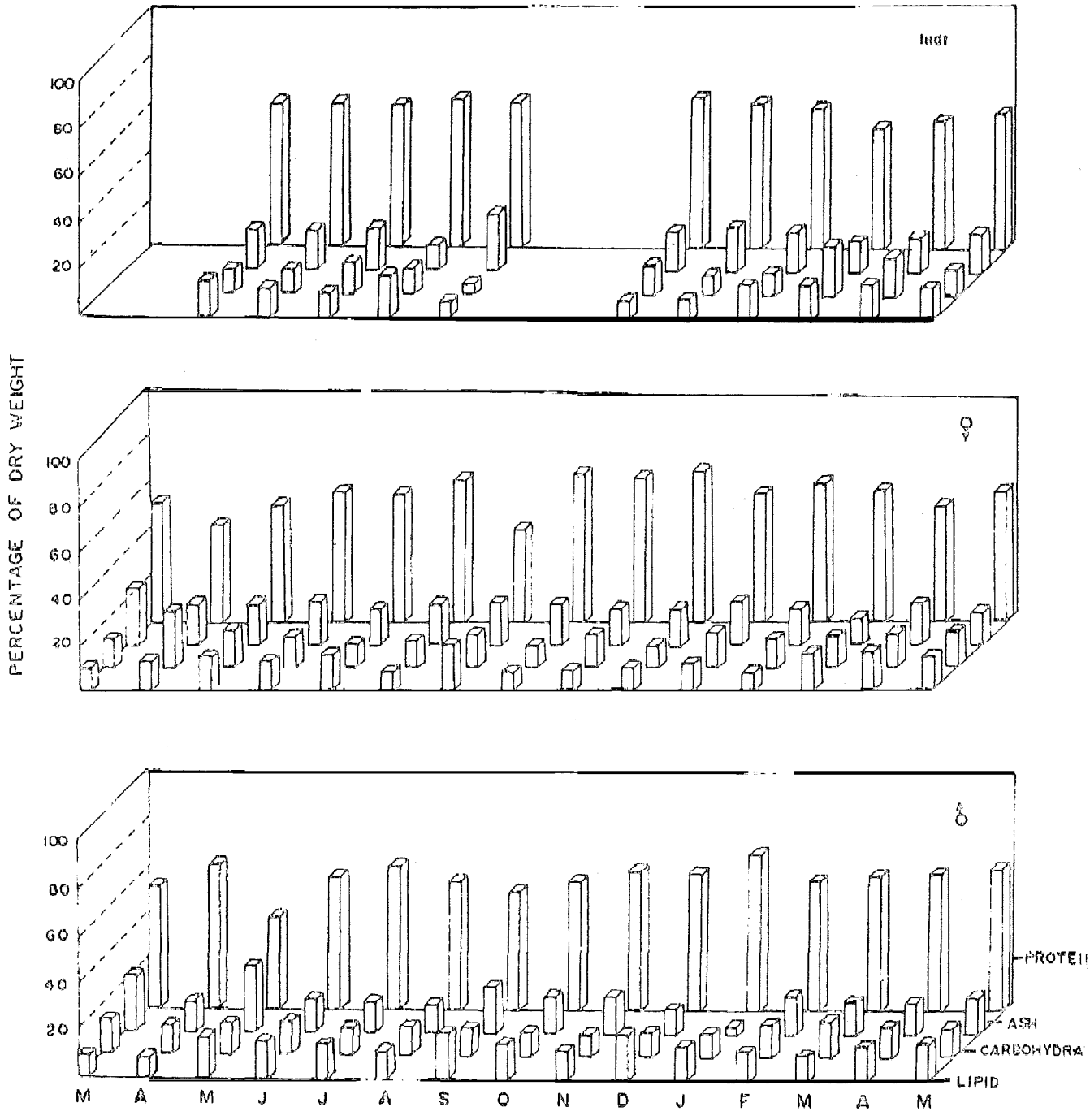

Fig. 1 : Monthly variations in the concentration of protein, lipid, ash and carbohydrate in different sexs of *T. angulata*.

MATERIALS AND METHODS

Monthly collections were made from an area of 0.25 m^2 from a station located on a sandy shore at Shivaji Park (lat 19° 2' 7" N and long 72° 50' 9" E) for a period of fifteen months from March 81 - May 82. Fresh gonadial smears were used to distinguish the specimens into male, female and indeterminates. The soft parts were separated carefully and their dry weight estimated after drying at 60°C to constant weight. A known quantity of the dry homogenate was used for the analysis of various biochemical constituents. Methods of Raymont, Austin and Linford (1964); Folch, Less and Stanley. (1956); and Dubois, Gilles, Hamilton, Robers and Smith (1956) were used respectively for protein, lipid and carbohydrate. Ash content was determined by igniting a known quantity of the dry powder in a muffle furnac at 450°C for 4-5 hrs. Difference in weight before and after ashing was considered as the ash weight. The method of El Wakeel and Riley (1957) was used for estimation of organic carbon. Calorific values were determined from biochemical constituents using the factors of Body (1945). Total nitrogen was calculated as per Absell (1974).

RESULTS

Variations in carbohydrate, protein, lipid, organic carbon and ash (expressed as percentage of the dry weight), calorific value (Kcl/g dry weight) and nitrogen values (%) are given in Figs. 1 and 2. Protein content ranged from 39.04 to 65.72 in male, 42.09 to 64.02 in female and 50.2 to 62.03% in indeterminates. Significant difference was not noticed in protein content between different sexes or easons (Table 1).

The record range for carbohydrate in male, female and indeterminate was respectively 9.96 to 16.24; 9.46 to 24.89 and 4.83 to 20.75%. On an average the females indicated maximum carbohydrate content, followed by males and indeterminates. Seasonal maximum was observed during the premonsoon period (Table 1).

Persentage composition of lipid varied from 8.87 to 19.78, 8 to 19.81 and 7.41 to 17.45 respectively for male, female and indeterminate. Sexwise, males had comparatively higher quantities than females and the seasonal peak was observed during the

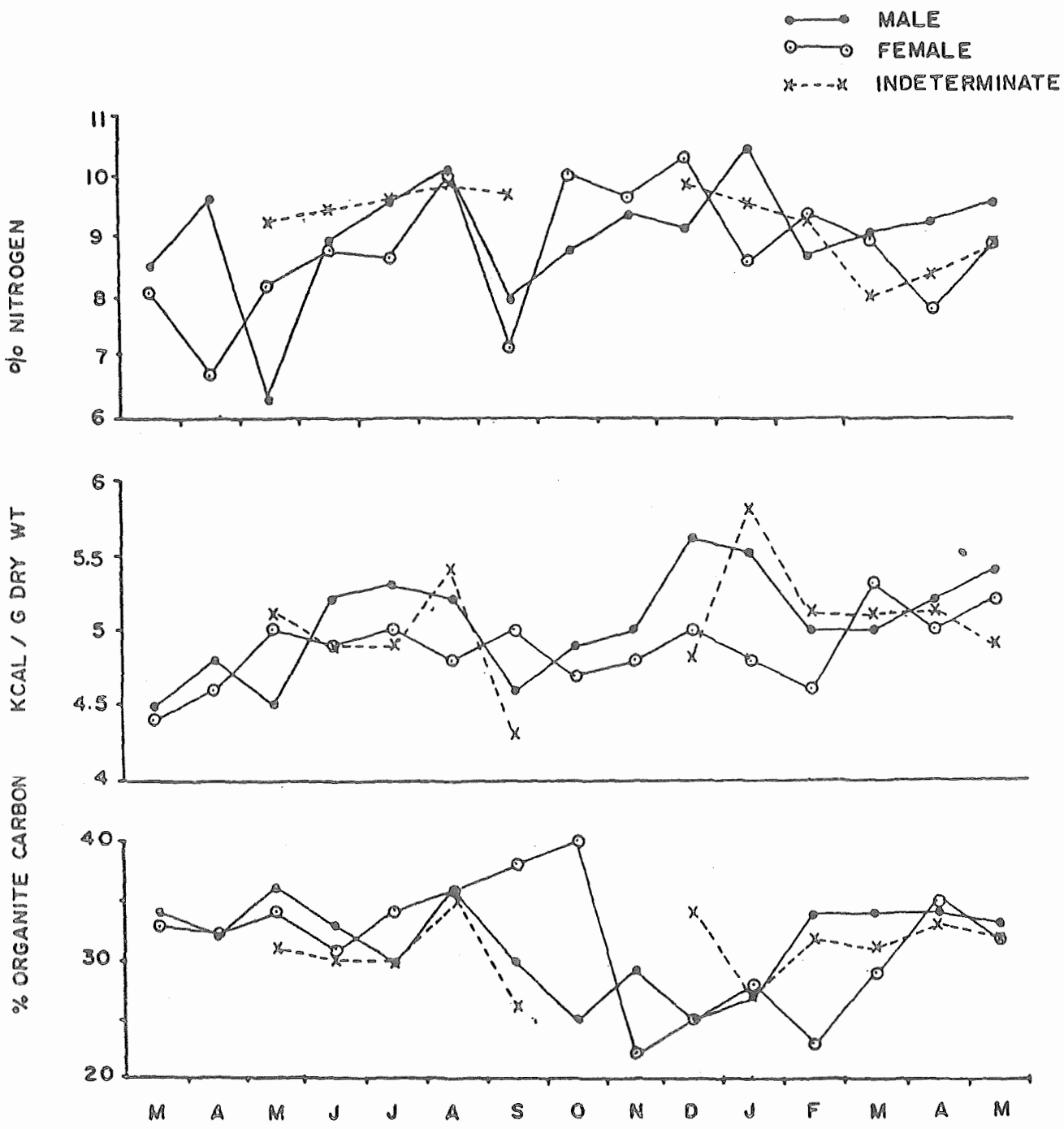

Fig.2 : Variations in the percentage of organic carbon, nitrogen and energy (Kcal/g dry wt) in male, female and inderterminate ones of T. angulata.

TABLE 1 : SEASONAL VARIATION IN THE BIOCHEMICAL COMPOSITION OF THE CLAM T. **ANGULATA** (VALUES EXPRESSED AS PERCENTAGE OF DRY WEIGHT).

Season		Protein	Carbohydrate	Liquid	Ash	Carbon	Energy Kcal/g dry wt	Total Nitrogen
Monsoon	M	57.45	12.94	13.85	14.54	32.05	5.09	9.19
(June-Sept)	F	54.15	12.62	14.15	17.81	34.58	4.92	8.67
Post-Monsoon	M	59.31	10.63	15.79	11.80	26.76	5.25	9.49
(Oct-Jan)	F	60.43	12.37	9.48	17.01	28.89	4.82	9.67
Pre-Monsoon	M	54.48	14.12	13.09	17.25	33.84	4.89	9.19
(Feb-May)	F	51.64	15.82	13.61	17.16	30.99	4.85	8.75

M - male : F - female

monsoon in females and the post monsoon in males. A decrease in lipin during the postmonsoon was obvious in females (Table 1).

Wide fluctuation in organic carbon content was noticed in females. In males it ranged from 25.25 to 35.77, 21.99 to 39.89 in females and 25.80 to 34.92 in indeterminates. Sexwise difference was not significant. Seasonal maximum was recorded during the monsoon in males and females (Table 1).

In T. **angulata** the percentage of water fluctuated from 73.5 to 89.34 with maximum during the monsoon.

Irrespective of sex ash values ranged from 4.01 to 27.56%. Average for the entire period of study is given in Table 2. Seasonal maximum was seen during the premonsoon. Seasonal difference in calorific content was not recorded in this species. However, minimum value was generally encountered in females (Fig. 2) and average for the entire period of study was 4.98 Kcal/g dry weight.

The maximum and minimum values of nitrogen in males and females were observed during December-January and April-May respectively. Seasonal maximum was found during the postmonsoon in both the sexes.

TABLE 2 : BIOCHEMICAL COMPOSITION OF DIFFERENT BIVALVE SPECIES (VALUES EXPRESSED AS PERCENTAGE OF DRY WEIGHT

Species	Organic Carbon	Protein	Lipid	Carbo-hydrate	Ash	Energy Kcal/g dry wt	Source
Lima hians	-	11.25-18.67	4.91-8.23	1.73-6.89	13.05-27.36	3.8-4.7	Ansell, 1974 a
Abra alba	-	53.38-61.94	3.26-6.83	6.99-17.16	13.51-29.62	3.86-4.53	Ansell, 1974
Meretrix m	-	50.37-60.75	2.40-3.80	8.81-13.75	-	-	Nagabhushanam & Deshmukh,1974
Meretrix casta	27.2-41.1	67.10-82.90	5.30-19.10	2.90-14.00	1.50-11.20	3.80-5.10	
	24.19-36.7	65.30-82.40	4.30-15.20	3.80-10.80	2.40-9.90	3.65-4.60	Krishna Kumari et al, 1977.
	24.00-37.3	66.40-80.70	5.50-14.50	1.90-12.40	1.93-12.2	3.2-4.70	
Paphia laterisulca	-	3.13-40.53	3.3-10.8	1.91-7.66	-	-	Nagabhushanam & Dhume, 1977.
Donax trunculus	-	52.94-64.31	2.94-6.94	6.47-14.71	18.71-30.00	3.90-4.50	Ansell et al, 1980.
Chamys opercularis	-	-	-	1.17-18.50	7.41-25.55	-	Taylor & Vann, 1979
Donax incarnatus	23.5-35	-	-	-		-	
	26.5-35.3	-	-	-	-	-	Balasubramanian et al, 1979.
	24.5-35.5	-	-	-	-	-	
Tellina angulata	31.48±3.44	56.56±6.28	14.01±2.88	12.87±1.79	15.07±5.59	5.04±0.353	
	31.39±5.20	54.65±6.55	12.65±3.83	14.05±3.69	16.65±2.96	4.86±0.236	Present work
	30.91±2.66	57.99±3.76	12.45±3.40	11.36±4.67	16.7±2.97	5.03±0.359	

DISCUSSION

In the present work a good agreement can be found between the pattern of biochemical composition and the reproductive cycle. In marine vivalves, the reproductive cycle is governed by a number of factors such as temperature, salinity, day length and density of the surrounding medium. Though continuous and discontinuous spawning has been observed in bivalves from Indian waters, spawning has been recorded during the monsoon in **Meretrix casta** (Harkantra, 1975) and in **T. angulata** (Krishna Kumari, 1985).

Carbohydrate was at its peak level during the premonsoon in both the sexes. A sudden decrease in carbohydrate level due to low availability of food and conversion of carbohydrate to lipid during gametogenesis has been reported (Pieters, Kluitmans, Zurburg and Zandea, 1975). In the present study, carbohydrate reached its maximum during the premonsoon and minimum during the postmonsoon. Although glycogen is a storage material in both the sexes, utilization of this reserve material will be faster in the females due to the formation of ova. Increase in glycogen during the prespawning period can be attributed to the proliferation of sex cells and decrease during the postspawning period due to the release of gamates from the gona.

A low metabolic energy demand during sexual resting stage together with the presence of large amount of food results in the accumulation of lipid reserves. In the present study lipid content was high during the monsoon. This can be due to the conversion of carbohydrate into lipid during gametogenesis. The annual changes in storage and utilization of these biochemical components are linked to the annual reproductive cycle (Gabbot, 1976). In the present study, a very low lipid content has been noticed in the females after spawning which coincided with the postmonsoon period.

In the most bivalves protein content remains at a relatively higher level throughout the year and decreases during the period of gametogenetic activity or throughout the breeding period (Nagabhushanam and Mane, 1975). Increase in protein during peak spawning has been reported earlier (Nagabhushanam and Bidarkar, 1978; Quayle, 1969). An increase in protein during the monsoon due to low metabolic activities of the species during low salinity conditions has been reported (Quayle, 1969).

Such an incease in protein content has not been observed in T. **angulata**. Values for biochemical composition of other bivalve species recorded earlier are given in Table 2. Eventhough the range recorded for protein, carbohydrate, ash, organic carbon etc. in T. **angulata** agrees with those reported for other bivalve sp (Ansell, 1974); Taylor and Venn, 1979; Balasubramanian, Sumitra Vijayaraghavan and Krishna Kumari, 1979) and Ansell, Frenkiel and Moueza, 1980), lipid values were found to be comparatively high in the present study. Deterioration in water quality at restricted areas around Bombay due to indiscriminate discharge of waste has been observed by Zingde, Trivedi and Desai (1979), Nair, Gajbhiye and Syed (1983) and Krishna Kumari and Nair (1986). However, the absernce of significant variation in the biochemical composition in this species from that of other bivalves of relatively clean environment reveals that the adverse water quality in this area has not reached an alarming state to produce any stress on the fauna.

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