

## Biochemical Composition & Calorific Value of Zooplankton from Northern Part of Central Arabian Sea

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Average biomass value of zooplankton obtained was  $22.69 \text{ ml. } 100 \text{ m}^{-3}$ . Average percentages of lipid, carbohydrate, protein and carbon were 6.3, 6.0, 23.6 and 34.62 respectively. Calorific values ranged between 6217 and 24708  $\text{J.g}^{-1}$  dry wt (8082 and 32120  $\text{J.g}^{-1}$  dry wt. ash free). The estimated secondary production of this area was found to be  $47.65 \text{ mg C.m}^{-3}.\text{d}^{-1}$ .

Information regarding biochemical composition and calorific value of zooplankton in Indian waters is meagre<sup>1-3</sup>. Estimates of these parameters are important to assess the part played by secondary producers in the food chain. Dead zooplankton forms an important part of organic detritus in the marine environment which also serve as food material for sedentary organisms including marine foulers. In this study biochemical constituents and energy content of zooplankton from the northern part of central Arabian Sea have been estimated. From the biomass data, attempts have been made to calculate the secondary production of the study area.

### Materials and Methods

Zooplankton samples were collected from 14 stations (Fig. 1) during 169 cruise of *R V Gaveshani* (25 May-8 June 1985), using an Heron-Tranter plankton net (mouth area  $0.25 \text{ m}^2$  and  $300 \mu$  mesh size). Vertical hauls were made from the bottom to surface (depths varied from station to station, Table 1) and the samples were deep frozen immediately after collection. In the shore laboratory, samples were thawed, washed with distilled water and dried in an oven at  $70^\circ\text{C}$  until a constant weight was obtained. Biomass estimations were made following the displacement volume method. Determination of moisture content was also made before analysis.

Estimations of protein, lipid, carbohydrate and organic carbon were made following standard procedures<sup>4-7</sup>. Calorific values were estimated using a Parr 1241 adiabatic bomb calorimeter. Subsamples were ashed in a muffle furnace at  $500^\circ\text{C}$  for 4 h and the calorific values were corrected for the ash content<sup>8</sup>.

### Results and Discussion

**Biomass**—Low biomass of zooplankton is obtained in the study area (av.  $22.69 \text{ ml. } 100 \text{ m}^{-3}$ , Table 1) compared to that reported from offshore waters of Bombay<sup>9</sup> (50), north Arabian Sea<sup>10</sup> (40) and around the Bombay offshore installations<sup>11,12</sup> (29.50 and 84.46). But the present value is comparable with that reported from Maharashtra coast<sup>13</sup> (22.9) and from Northern part of central Arabian Sea during II OE<sup>14</sup> (approximately same). This can be due to the fact that all the three observations were made in the premonsoon season. The depth varied from one station to other (Table 1) and the average depth was 75 m. The maximum value of biomass was at st. 4031 and minimum at st. 4003 (Table 1).

**Biochemical analysis**—The concentration of protein was higher than the concentrations of carbohydrate and lipid (Table 1). The average value of protein and carbohydrate obtained in the present study is comparable to the reported values (ref. 13

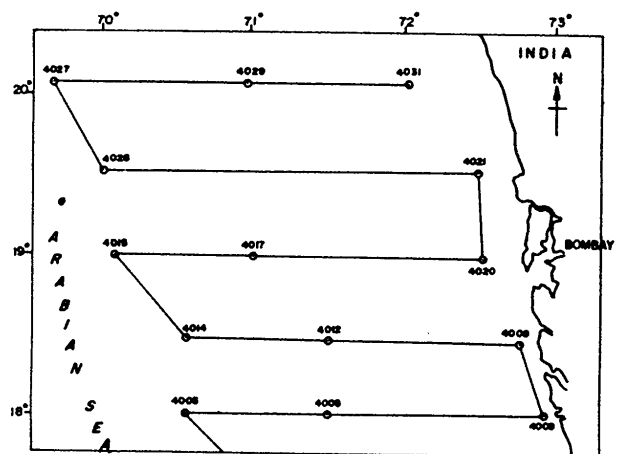


Fig. 1 — Study area showing sampling stations

Table 1 — Concentration of Biochemical Components and Calorific Values of Zooplankton

Station No.	Depth (m)	Biomass (ml. 100 m <sup>-3</sup> )	Cal. value (J. g <sup>-1</sup> )	Lipid (%)	Protein (%)	Carbohydrate (%)	Organic C (%)	Cal. Value (J. g <sup>-1</sup> dry wt. ash free)
4003	200	5.20	19,169	—	—	—	—	25,031
4005	80	15.50	8061	7.8	20.9	7.9	28.01	8593
4008	15	48.00	7014	8.6	22.7	6.8	34.18	9117
4009	15	74.66	17,116	5.3	24.6	6.3	33.79	22,248
4012	80	8.00	20,392	6.8	28.3	5.7	35.23	26,510
4014	115	12.17	20,233	7.3	27.1	5.3	37.32	26,304
4015	135	12.15	6217	9.5	17.7	5.7	27.82	8082
4017	80	11.00	16,969	8.5	30.3	5.4	47.52	22,060
4020	25	49.60	22,144	—	—	—	—	28,785
4021	25	28.80	14,170	4.1	18.4	3.5	33.58	18,423
4026	80	10.50	21,494	3.9	24.1	7.5	37.87	27,943
4027	150	8.53	13,278	6.5	15.8	5.3	29.91	17,262
4029	80	26.00	24,708	5.0	27.2	7.8	31.26	32,120
4031	25	152.00	14,023	2.8	25.5	5.1	38.97	18,230
Mean	75	22.69	16,072	6.3	23.6	6.0	34.62	20,895
Sd.*		21.16	5865	2.12	4.55	1.29	5.47	7841

\*Standard deviation

For calculating av. biomass st. 4031 is not included.

and 2 & 14 respectively), while the lipid value is less<sup>15</sup>.

The organic carbon value (Table 1) is higher than the value reported<sup>2</sup> from south central Arabian Sea. Organic carbon value was significantly correlated with the protein ( $r=0.72$ ) and moderately with calorific values ( $r=0.42$ ), but its relation with lipid and carbohydrate is insignificant. The difference in carbon values as reported by different workers may be attributed to the differences in the zooplankton composition<sup>16</sup>.

**Calorific values** — The average calorific value (Table 1) 16,072 J.g<sup>-1</sup> dry wt (20,895 j.g<sup>-1</sup>, corrected for ash) is comparatively higher than the one reported earlier (13,827 J. g<sup>-1</sup> dry wt) from coastal waters of India<sup>15</sup>. The difference recorded can be attributed to the general composition and physiological status of planktonic organisms at the time of collection<sup>17</sup>. In the present study, calorific value is significantly correlated ( $r=0.62$ ) with protein and its correlation with carbohydrate and lipid are insignificant.

**Secondary production** — The biomass values calculated on the basis of displacement volume can be converted to dry weight using the relation<sup>18</sup>, 1 ml displaced volume = 81.7 mg dry wt. From this relationship, the standing stock of zooplankton was calculated as 64.19 ml. m<sup>-2</sup> (dry wt 5244.32 mg. m<sup>-2</sup>). The average carbon content of zooplankton during this study, (estimated as total organic carbon) was

found to be 34.6%. From this, the carbon content in this area is estimated as 1814.5 mg C. m<sup>-2</sup>. Because the zooplankton samples were dominated by copepods, the equation given by Cushing<sup>19</sup> is applied for calculating the secondary production. The average temperature needed for this calculation was taken from the data collected by us during the past three years from the same locality. Thus the calculated secondary production was found to be 48.65 mgC. m<sup>-2</sup>. d<sup>-1</sup>.

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