

## BIOCHEMICAL STUDIES ON SOME ZOOPLANKTON OFF THE WEST COAST OF INDIA

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### ABSTRACT

Proximate biochemical analyses on twelve zooplankton species showed that protein was the predominant biochemical component followed by lipid. Carbohydrate content was very low especially in species with high water content or calcareous shell. The overall mean values calculated as a percentage of dry weight was 46.06% protein, 11.4% lipid and 2.6% carbohydrate. No reciprocal relationship was noticed between protein and lipid fractions. The organic carbon content fluctuated from 19.2 to 41.4% (Av 31.3%). Zooplankters with poor organic carbon usually gave low caloric value. The results indicate that protein may function as a metabolic reserve in tropical zooplankton species.

Biochemical studies on zooplankton are important for understanding their metabolism, nutritive value and role in aquatic food chain. Investigations have been carried out by many others on the biochemistry of estuarine zooplankters. The present paper describes the major biochemical constituents, organic carbon content and caloric value of 12 oceanic zooplankton species collected between Mormugoa and Mangalore during the 59th cruise of RV *Gaveshani* (6th-14th October, 1979).

Twentyfive zooplankton samples were collected by vertical hauls (200 m to surface) using Indian Ocean Standard Net. The samples collected at 18 stations located beyond the continental shelf (Fig. 1) were frozen immediately. On reaching the shore laboratory, the zooplankton samples were pooled, thawed and sorted into different species. To arrive at percentage dry weight values, 2-3 replicate analyses were done for each species. Protein was estimated by the method of Lowary, Rosebrough, Farr and Randall (1951), lipid by the method of Bligh and Dyer (1959), carbohydrate by the method of Dubois, Gilles, Hamilton, Rebers and Smith (1956) and organic carbon content by Wakeel and Riley's method (1959). The caloric value of different species was calculated from the major biochemical constituents using the conversion factors given by Prosser and Brown (1965).

The average values of the major biochemical constituents are given in Table I. Protein formed the main constituent (22.3 to 62.54%) in terms of dry weight in all the species substantiating the earlier observations on the biochemical composition of zooplankton species (Raymont, Austin and Linford, 1968). Lower values were recorded in species with higher water content (*Pyrosoma* sp.) and with calcareous shell (*Creseis acicula*). The highest protein content (62.54%) was obtained in the copepod *Undinula vulgaris*. No significant spatial variations ( $P < 1\%$ ) were noticed in the protein fraction of this species collected between Mormugoa and Mangalore during the present study or from those collected from the Laccadive Sea (Stephen, Panampunnayil, Gopalakrishnan and Sankaranarayanan, 1979) or from the Andaman Sea (Goswami, Rao and Matondkar, 1981). Almost the same per-

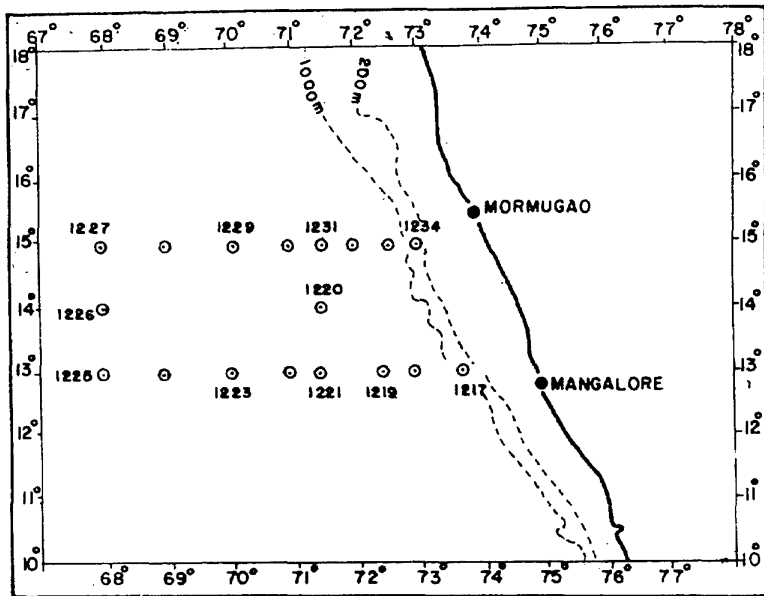


Fig. 1. Location of the sampling stations.

centage protein content was reported in *Neomysis integer* of Southampton waters, in *Leptomysis lingvura* of the Mediterranean coast (Raymont, Austin and Linford, 1966) and in another inshore British mysid *Praunus flexuosus* (Seguin, 1968). However, the protein content varied in species belonging to different groups (Table I). Variations in the protein content in marine organisms were ascribed to the seasonal changes, age of organisms analysed and salinity (Raymont, 1972).

No reciprocal relationship was observed between protein and lipid content in all the 12 species in contrast to some forms where reciprocal relationship was reported (Nakai, 1955). The lipid fraction recorded in the present study was rather low (4.1 to 17.1%) compared to the reported values for planktonic organisms from higher latitudes. Conover (1964) estimated 60% lipid content for the boreal copepod *Calanus hyperboreus*. Nakai (1955) gave a lipid content of 53.3% for *C. plumchrus*. The high lipid in forms from colder regions may reflect extensive storage. The abundant supply of phytoplankton food in the warm tropical environment (Qasim, 1977) would render lipid storage unnecessary and may probably account for the low lipid content in the zooplankton species investigated.

Carbohydrate content was poor especially in gelatinous forms and species with calcareous shell. The values fluctuated between 1.0 to 4.2% and are well within the range given for species from the Laccadive Sea (Stephen, Panampunnayil, Gopalakrishnan and Sankaranarayanan, 1979). The carbohydrate fraction was about 2% in *Acanthephyra sanguinea* and *Sergestes* sp. (Table I) and the same percentage was quoted for 3 decapods, *Acanthephyra*, *Gennadas* and *Sergestes* (Raymont, Austin and Linford, 1967) and in 3 euphausiids *Meganyctiphanes*, *Thysanoessa* and *Nematoscelis* (Raymont, Srinivasagam and

**Table I.** Average protein, lipid, carbohydrate content, organic carbon and caloric value of 12 zooplankton species.

Species	Total dry wt (mg)	% dry weight				Caloric value kcal/g dry wt.
		Protein	Lipid	Carbohydrate	Organic carbon	
Copepoda						
<i>Undinula vulgaris</i> (Dana)	140	62.54	9.5	3.5	32.4	3.67
<i>Eucalanus elongatus</i> (Dana)	210	53.32	15.5	2.9	28.2	3.82
<i>Rhincalanus cornutus</i> (Dana)	85	50.34	17.4	4.2	29.0	3.94
<i>Labidocera acuta</i> (Dana)	160	52.38	13.5	2.5	30.2	3.57
<i>Corycaeus speciosus</i> Dana	110	49.21	11.8	2.7	28.4	3.28
Decapoda						
<i>Acanthephyra sanguinea</i> Kemp	500	53.32	12.1	2.2	32.0	3.47
<i>Sergestes</i> sp.	270	44.42	12.4	2.0	35.0	3.12
Chaetognatha						
<i>Sagitta pacifica</i> Tokioka	150	42.14	10.3	2.4	39.4	2.84
Ostracoda						
<i>Cypridina dentata</i> (Müller)	780	46.45	11.2	3.6	38.6	3.15
Euphausiacea						
<i>Euphausia</i> sp.	400	45.22	12.5	2.8	41.4	3.20
Pyrosomidae						
<i>Pyrosoma</i> sp.	50	22.30	6.1	1.0	19.2	1.55
Pteropoda						
<i>Creseis acicula</i> Rang	440	31.12	4.1	1.1	21.5	1.74
	Mean	46.06	11.4	2.6	30.4	3.11

Raymont, 1969). The low carbohydrate content in the organisms both from temperate and tropical waters would suggest that glycogen, the usual carbohydrate storage material does not contribute much to the body reserve and other biochemical constituents may be utilized as metabolic substrates.

The amount of food available and the energy stored have been reported to influence the carbon content of zooplankton (Omori, 1969). Organisms with low organic carbon content were observed to give low caloric value and the lowest value for both the organic carbon and caloric value was obtained in *Pyrosoma* sp. During the present investigation, the calanoid copepod species was found to have a high caloric value and the caloric content in the 12 species studied varied from 1.55 to 3.94 kcal/g dry weight. These values are comparable with the caloric content reported for coastal zooplankters from Cechin (Gupta, 1977).

The low values obtained for both lipid and carbohydrate in the present study indicate that protein functions as the principal metabolic substrate in tropical zooplankton species.

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