Advance Journal of Food Science and Technology 2(2): 96-99, 2010
ISSN: 2042-4876

Sibmitted Date: December 12, 2009 Accepted Date: December 30, 2009 Published Date: March 10, 2010

Biomass and Biochemical Composition of Zooplankton along the Arabian Sea, West Coast of India

L. Jagadeesan, N. Arivuselvan, G. Thirumaran, P. Anantharaman and T. Balasubramanian
CAS in Marine Biology, Annamalai University, Parangipettai - 608502, Tamil Nadu , India

Abstract: Zooplankton biomass and their protein, lipid and carbohydrate were estimated from Kochi, Kozhicode and Kannur regions of the Arabian Sea. Biomass (ml/100 m^3) varied from 25.2 to 42 ml/100 m^3. Protein formed the major component, varied from 21.07 to 40.73%. Lipid content was ranged from 11.02 to 19.61 % and carbohydrate (5.83 to 14.98%). The carbohydrate content was recorded maximum (14.98%) in Kannur region and which also expressed the minimum protein content (21.07%). Maximum % of protein (40.73%) and minimum levels of lipid (11.02%) and carbohydrate (5.83%) were noticed in Kochi region. Maximum % of lipids (19.62%) was observed in Kozhicode region.

Key words: Arabian sea, carbohydrate, biomass, lipid, protein, zooplankton

INTRODUCTION

Zooplankton is considered an important compartment of aquatic ecosystems and plays the important role in the food web. It represents the channel of transmission of the energy flux from the primary producers to the top consumers (Nicoletta and Monica, 1999). Studies on the biochemical composition and energy content of zooplankton is important, to have better understanding of Productivity and cyclic of biogeochemical elements (Nageshwara and Rathnakumari, 2002) in coastal regions. Proximate composition of zooplankton is important and they depending upon the species contribution in total biomass. Copepoda contain HUFA (Highly Unsaturated Fatty Acids) and PUFA (Poly Unsaturated Fatty Acids), for the reason, recent days copepods are used as the feed for the cultured finfish and shellfish larvae. Biochemical compositions of zooplankton were studied by different authors in different regions of India viz., Goswami *et al.,* (1981a) from Andaman Sea; Goswami *et al.* (1981b) in west coast of India. Sumitra-Vijayaraghavan *et al.* (1982) in Arabian Sea off the South Central West Coast of India; Nandakumar *et al.* (1988) in Northern part of Central Arabian Sea; Kumari and Achuthankutty, (1989) in North Eastern Arabian Sea; Sreepada *et al.* (1992) in Bay of Bengal; Bhat and Wagh (1992) and Kumari *et al.* (1993) in oil fields of Bombay; Kumari and Goswami, (1993) in Northwest bay of Bengal; Goswami *et al.* (2000) in west coast of India; Nageshwara and Rathnakumari (2002) in Visakapatnum harbour waters. However knowledge of the biochemical dynamics of secondary production Arabian sea is limited. So the Present study intent to investigate the variations of zooplankton biomass and their biochemical composition in three different regions of Arabian Sea.

MATERIALS AND METHODS

Horizontal zooplankton samples were collected from seven stations during FORV Sagar Sampada Cruise 272 Southwest coast India (Fig. 1) during sep 16th to oct 3rd 2009, using Bongo net (mesh size 200 µm 0.6m mouth dia) with calibrated flow meter fixed at the center of the net. Samplings were made on 30 m depth and the net was toed in 10 min. After measuring the Biomass (Displacement methods) samples were separated in two halves; one halves were preserved in 5% neutralized formalin for the purpose to analyze the dominant species. Another half of samples were cleaned with distilled water to remove the debris and then dried at 60ºC until constant weight was obtained for the purpose to determine the biochemical composition. Protein was measured spectrometrically by the Birutte method (Raymont *et al.*, 1964). Carbohydrate was measured by Duboiss *et al.* (1956), Lipid content was estimated by Folch *et al.* (1957). Triplicates were maintained in each experiment. The salinity, Dissolved oxygen (DO) and Temperature data were obtained from the CTD.

RESULTS AND DISCUSSION

The variations of the salinity, temperature and dissolved oxygen values are noticed in (Fig. 2-4). The Minimum salinity and minimum dissolved oxygen values were recorded in Kozhicode region. The Maximum salinity was noticed in Kochi region. Maximum dissolved oxygen and moderate salinity were recorded in Kannur region. Fluctuations of salinity and dissolved oxygen depending upon the adjoining distances and runoff waters from coastal regions.

Corresponding Author: L. Jagadeesan, CAS in Marine Biology, Annamalai University, Parangipettai - 608502, Tamil Nadu, India

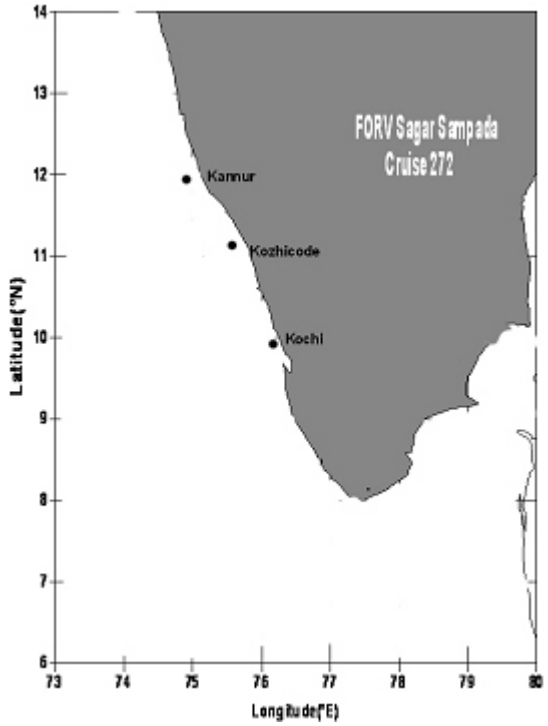

Fig. 1: Stations of the FORV - Sagar Sampada cruise 272

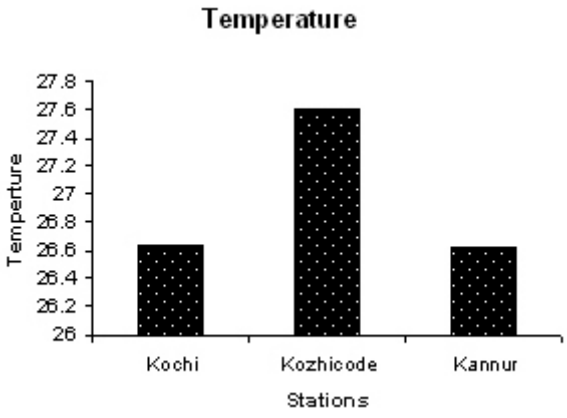

Fig. 2: Temperature variations in different stations

The biomass values varied from 25.2 (ml/100 m^3) to 42 (ml/100 m^3); the minimum of 25.2 (ml/100 m^3) was recorded in Kozhicode and maximum of 42 (ml /100 m^3) was occurred in Kannur stations respectively (Fig. 5). Biomass of the particular environment depends upon the productivity, nutrient status and runoff waters.

The average protein values are shown in Fig. 6. Protein is the major component, which is ranged from 21.07 to 34.65%. The maximum protein level was noticed in Kochi, when compare the other regions due to dominance of the calanoid copepods (Table. 1), fish eggs and larvae (Goswami *et al*., 2000). The values recorded in the present study are comparable to the earlier values

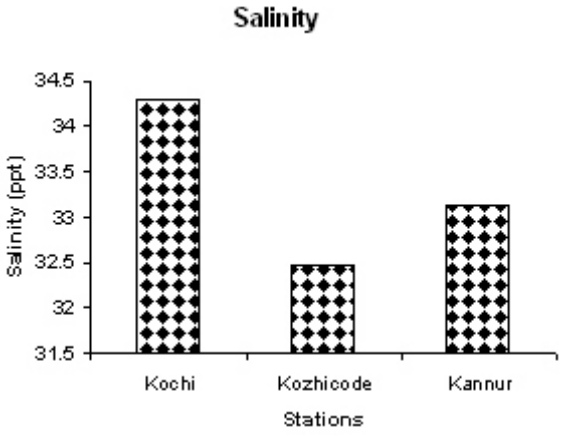

Fig. 3: Salinity variations in different stations

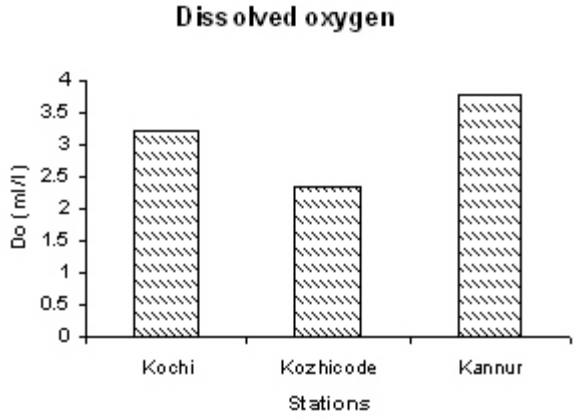

Fig. 4: Dissolved oxygen variations in different stations

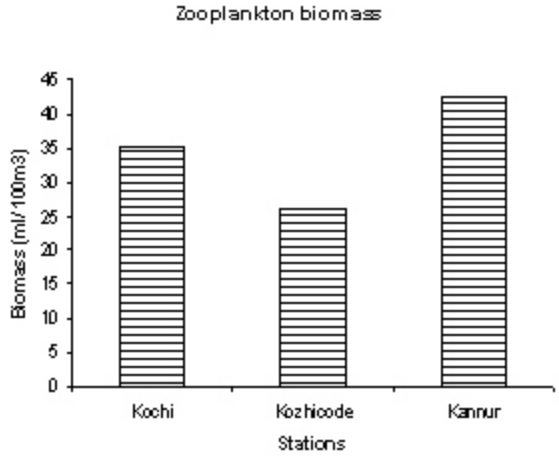

Fig. 5: Zooplankton biomass in different stations

reported for the northern part of the Arabian seas, Lower and some what higher than those reported in the Andaman sea (Goswami *et al*., 1981a), North west bay of Bengal (Kumari and Goswami, 1993), Arabian sea of the south central west coast of India (Sumitra-Vijaragavan *et al*.,

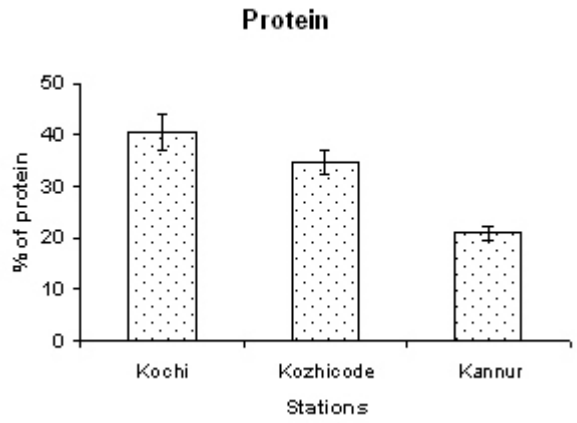

Fig. 6: Carbohydrate content of zooplankton

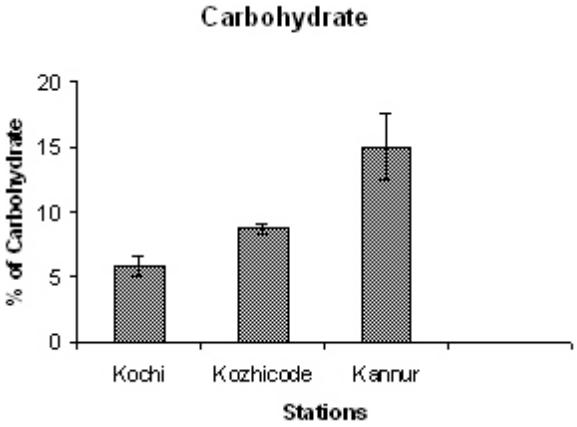

Fig. 7: Protein content of zooplankton

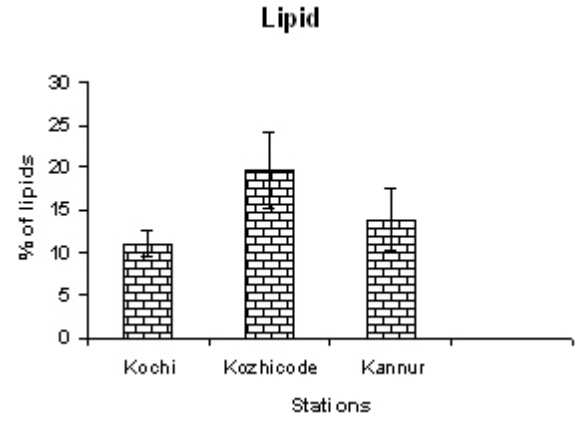

Fig. 8: Lipid content of zooplankton

1982) and East coast of India. The variation of the protein content depends upon the utilization as a metabolic substrate, seasonal changes, age of the organisms, time of collection, salinity of the area and species contribution in zooplankton biomass (Sreepada *et al*., 1992).

Table1: Names of the stations, Latitude and longitude and dominant phytoplankton species and zooplankton species

Stations	Lat.	Long.	Dominant phytoplankton	Dominant zooplankton
Kochi	10º 00.136 N	75º 58.86 E	*Cerartium* sp. *Plurosigma* sp.	Calanoid copepod, Decapods larvae, *Oikopleuro* sp.
Kozhicode	11º14.192N	75 º 36.851E	*Skeletonema costatum* and *Coscinodiscus* sp.	Fish eggs, larvae and *Euterpina* sp. *Microsetella* sp.
Kannur	11º59.471N	75º03.446E	*Chaetocerous* sp. *Rhizosolenia* sp.	Jellies, Polycheate larvae and Copepods.

Carbohydrate is the minor component in all stations. Carbohydrate ranged from the 5.83 to 14.98%. The maximum carbohydrate percentage was recorded in Kannur region (Fig. 7). Because in this region muti-diatomaceous bloom (mixture of *Chaetoceros* sp. and *Rhizosolenia* sp.) were observed (Table. 1), that might be attributed to large quantities, which could not be separated from the zooplankton biomass. Carbohydrate content of the present study is higher than the earlier reports. Our results supported the conclusions of Raymont and Conover (1961) and Kumari and Goswami (1993) that the Carbohydrate content of the planktonic forms are usually low and does not appear to represent a significant nutritional reserve.

Lipids are the second major component in zooplankton, which is ranged from 11.02 to 19.67% (Fig. 8). Lipids are normally stored for the purpose of energy reserve in emergency period. Normally Arabian seas have continuous supply of phytoplankton around the year and the rate of primary production always exceeding than the rate of consumption by zooplankton, so the importance's of fat is very much declined as its reflects in its lower values than the protein (Bhat and Wagh, 1992). The maximum lipid content was recorded in the Kozhicode region because the greater occurrences of lipid containing groups like copepods, oil globule Fish eggs and larvae (Table 1).

CONCLUSION

The variation of the proximate composition of zooplankton depends upon the environmental parameters, phytoplankton abundances and species contribution to the zooplankton biomass.

ACKNOWLEDGMENTS

The authors thanks to Dr. V.N. Saneevan, Dr. N. Saravanan and Dr. T. Shanmugaraj, Scientists-CMLRE-MoES to provide the funding for the research work and given the opportunity to participate the Cruise 271 in FORV-Sagar Sampada.

REFERENCE

Duboiss, M., K.A. Gillas, J.K. Hamilton, R.A. Rbus and F. Smith, 1956. Calorimetric method for determination of sugars and related substances. Anal. Chem., 28: 350-356.

Goswami, S.C., T.S.S. Rao and S.G.P. Matondkar, 1981a. Biochemical composition of zooplankton from the Andaman Sea. Ind. J. Mar. Sci., 10: 296-300.

Goswami, S.C., T.S.S Rao and S.G.P Matondkar, 1981b. Biochemical studies on some zooplankton off the west coast of India. Mahasagar. Bull. Nat. Inst Oceanogr., 14: 313-316.

Goswami, S.C., K.L. Krishna and S. Yashoshri, 2000. Diel variations in zooplankton and their biochemical composition from Vengurla to Ratnagiri, west coast of India. Ind. J. Mar. Sci., 29: 277-280.

Kumari, L.K. and S.C. Goswami, 1993. Biomass and biochemical composition of zooplankton from northwest Bay of Bengal. Ind. J. Mar. Sci., 22: 143-145.

Raymont, J.E.G., J. Austin and E. Linford, 1964. Biochemical studies on marine zooplankton l. The biochemical composition of *Neomysis integr.* J. Cons. Perm. Int. Explor. Mer., 28: 354-363.

Folch, J., M. Lees and G.H. Solane-Stanley, 1957. A simple method for the isolation and purification of total lipid from animal tissues. J. Biol. Chem, 226: 497-509.

Nandakumar, K., L.K. Bhat and A.B. Wagh, 1988. Biochemical composition and calorific value of zooplankton from Northern part of Central Arabian Sea. Ind. J. Mar. Sci., 17: 48-50.

Kumari, L.K. and C.T. Achuthankutty, 1989. Standing stock and biochemical composition of zooplankton in the northeastern Arabian Sea. Ind. J. Mar. Sci., 18: 103-105.

Sumitra-Vijayaraghavan, R.A.S. and T.S.S. Rao, 1982. Studies on zooplanakton from the Arabian Sea off the South Central West Coast of Ind. Indian J. Mar. Sci., 1: 70-74.

Kumari, L.K., V.R. Nair and S.N. Gajbhiye, 1933. Biochemical composition of zooplankton from the offshore oil fields of Bombay. Proc. Nat. Acad. Sci. India, 63(B): 161-167.

Nicoletta, R. and M. Monica, 1999. Considerations on the biochemical compostion of some fresh water zooplankton species. J. Limnol., 58(1): 58-65.

Bhat, K.L. and A.B. Wagh., 1992. Biochemical composition of zooplankton of Bombay high oil flat farm area in Arabian seas. Ind. J. Mar. Sci., 21: 220-223.

Raymont, J.E.G. and R.J. Conover, 1961. Further investigations on the carbohydrate content of marine zooplankton. Limnol. Oceanogr., 6: 154-164.

Nageshwara, R.I. and R. Rathnakumari, 2002. Biochemical compositon of zooplankton from visakapatnum harbour waters east coast of India. Ind. J. Mar. Sci., 31: 125-129.

Sreepada, R.A., C.U. Rivonkar and A.H. Parulekar, 1992. Biochemical composition and caloric value of zooplankton from Bay of Bengal. Ind. J. Mar. Sci., 21: 220-223.