Current Research Journal of Biological Sciences 3(1): 132-136, 2011
ISSN: 2041-0778

Received: December 20, 2010 Accepted: January 10, 2011 Published: March 05, 2011

Studies on Copepods from Chennai Coast (Cooum and Adyar), Bay of Bengal - During the Cruise

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Abstract: Copepods were collected at six stations from Chennai coast (Cooum and Adyar) Bay of Bengal during 2006. 35 copepod species were identified, out of these 31 species belong to Calanoids, 4 Cyclopoids were recorded in this study. Among Calanoida Family Temoridae (*Temora discaudata*, *Temora tubinata* and *Temora stylifera*) and Pseudodiaptomidae (*Pseudodiaptomus serricaudatus)* were recorded abundant in the middle and offshore stations and low in the near shore stations. Family Acartiidae (*Acartia spinicauda)* was abundant in the near shore station. The Shannon - Weiner diversity index (*H'*) showed the occurrence of copepods were low at near shore stations C1 and A1. The low occurrence of copepods in the near shore stations compared to that of offshore stations may be due to the inflow of effluents, sewage and domestic waste discharged from the Cooum and Adyar River.

Key words: Abundance, Chennai coast, copepods, diversity

INTRODUCTION

Zooplanktons are dominated over the rest of the organisms in the sea and important role in energy transfer of the marine ecosystem (Severini *et al.*, 2009). One of the largest contributions to marine zooplankton are the abundant segmented crustacean of the class copepods are mainly herbivorous, although some species are omnivorous and carnivorous. Copepods found widely distributed throughout the world Oceans and secondary consumers of the marine environment usually comprising 80% of its biomass (Sampey *et al*., 2007). Copepods are among the most important secondary producers in coastal and marine ecosystems, representing an important link between phytoplankton, micro zooplankton and higher tropic levels such as fish (Beyst *et al*., 2001).

Cyclopoida and Herpacticoida showed a remarkable ecological interest and serve as first compartment of the aquatic food chain. Calanoida dominated in the coastal waters whereas Cyclopoida dominated in fresh water and Herpacticoida dominated in meiobenthic system. These orders contribute approximately 5,500 species (Bowman and Abele, 1982). The aim of the present study is to study the abundance of copepods from Chennai coast (Cooum and Adyar) Bay of Bengal, India.

MATERIALS AND METHODS

Study area: Chennai is located at 80º17′ E longitudes and 13º15′ N latitude is a beautiful metropolitan city in south India. Chennai is the capital of Tamil Nadu is subjected to industrial developments and pollution explosions. The North Chennai is referred as the industrial area. The central Chennai is known as the commercial hub of the city and the south and west Chennai are mostly comprised of residential complexes. It is a fairly low-lying strip of land and mean sea level is 10 m. The city covers 172 km^2 with a population of about 6 million and tropical maritime climate with an annual rainfall of 1285 mm out which 60% is receive from Northeast monsoon (October to December).

The Chennai city is splashed by two rivers namely the Cooum River which flows through the centre of the city and the other one is the Adyar River which flows towards south during northeast monsoon season. Apart from this Buckingham Canal is running parallel to the coast which links the two rivers at few points. The study area covers a part of Chennai coast from Cooum and Adyar (80º25′ E; 13º14′; 80º16′ E; 12º49′ N) located in the part of Chennai.

Sampling stations: Six sampling stations were fixed along the Chennai coast (Cooum and Adyar). Cooum (C1) and Adyar (A1) representing near shore stations and its distance covered from 3 km (Fig. 1). C2 and A2 represent middle stations where distance covered was 5 km away from C1 and A1. Similarly stations C3 and A3 represent off shore stations with a distance covered 5 km away from middle shore stations of C2 and A2. Station C1 receives large quantities of domestic sewage and industrial effluents through the river Cooum mouth. Station A1 receives domestic and sewage wastes from the river Adyar mouth.

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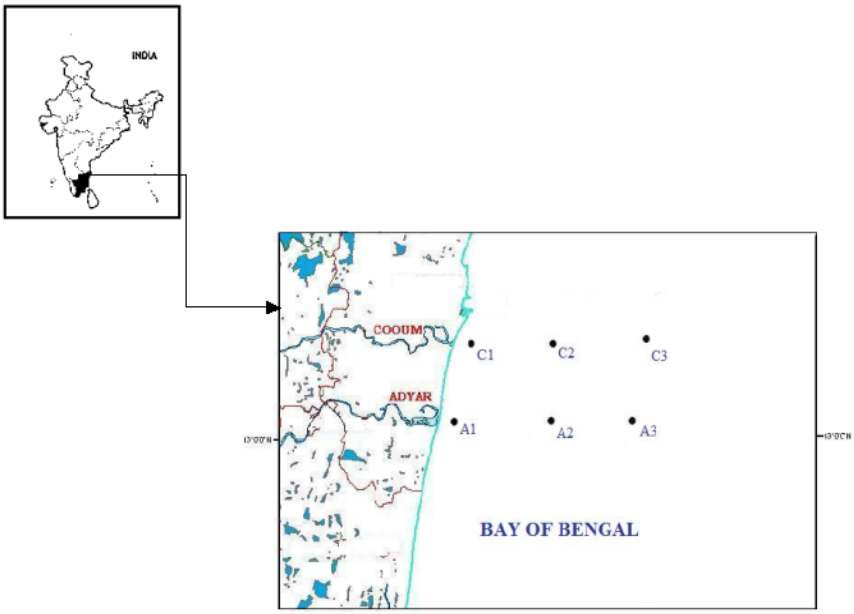

Fig. 1: Sampling stations

Sample collection: Plankton samples were collected from Cooum and Adyar (2006) by CRV Sagar Purvi vessel of National Institute of Ocean Technology, Chennai. Plankton samples were collected using Bongo net (mouth area 0.28 m^2, mesh width 300 μm). A digital flow meter (Hydro-Bios) was mounted at the centre of the mouth opening. The net was towed obliquely 1 m below the surface water and the sampling time was approximately 10 to 15 min at the vessel cruise speed of 2 knots. The samples were immediately preserved in 5% formalin. Plankton samples were identified by using standard keys (Kasturirangan, 1983). Copepods were counted using the Sedgewick-Rafter Cell Counter under a compound microscope (Nikkon). Enumeration was carried out in five sub samples and mean was calculated.

Statistical analysis: Diversity index were calculated (Shannon and Weiner, 1963).

RESULTS

On the whole 35 species were identified (Table 1). Calanoid copepods were most diversed group represented by 31 species. The species recorded were Acartiidae (*Acartia spinicauda, Acartia southwelli* and *Acartia dana*); Candaciidae (*Candacia bradyi* and *Candacia discaudata*); Centropagidae (*Centropages calaninus, Centropages furcatus, C.dorsispinatus Thompson, C.tenuirernis Thompson* and *Isias tropica sewell*); Eucalanidae (*Eucalanus attenuatus*, *Eucalanus crassus* and *Eucalanus elongates*); Euchaetidae (*Euchaeta corninna danae*); Lucicutiidae (*Lucicutia flavicornis*); Paracalanidae (*Paracalanus parvus*); Pontellidae (*Labidocera acuta, Labidocera pectinata, Labidocera minuta, Labidocera pavo, Pontella danae, Pontellopsis scotti sewell, Pontellopsis macronyx, Calanopia aurivilli, Calanopia elliptica* and *Calanopia minor*); Pseudodiaptomidae (*Pseudodiaptomus serricaudatus*); Temoridae (*Temora discaudata, Temora tubinata* and *Temora stylifera*); Scolecithricidae (*Scolecithrix danae*). 4 cyclopoid copepods were collected Oithonidae (*Oithona brevicornis* and *Oithona linearis)*; Corycaeidae (*Copilia vitrea*) and Sapphiriniae (*Sapphirina ovatolanceolata Dana*).

Percentage composition: Acartiidae and Temoridae (18%) showed the highest percentage composition at near shore station C1 and family Oithonidae (4%) showed the lowest percentage composition. Whereas the Corycaeidae and Sapphirinidae were totally absent. In middle station C2, Candaciidae and Temoridae (21%) showed the highest percentage composition and Family Corycaeidae (3%) showed the lowest percentage composition. Oithonidae and Sapphirinidae were absent. Temoridae (16%) showed the highest percentage composition in the offshore station C3. Euchaetidae, Pseudodiaptomidae and Scolecithricidae (3%) showed the lowest percentage composition and Oithonidae (3%) and Corycaeidae (2%) showed the lowest percentage composition. Sapphirinidae was absent in the offshore station C3.

Adyar River mouth: Temoridae and Pseudodiaptomidae (18%) showed the highest percentage composition and Family Oithonidae (2%) showed the lowest percentage

Table 1: List of Copepod species recorded along the Chennai Coast during 2006

Family	Species name	C1	C2	C3	A1	A2	A3
CALANOIDA							
Acartiidae	*Acartia spinicauda*	**	**	*	**	**	*
	Acartia southwell	–	–	–	–	–	–
	Acartia danae Giesbrecht	–	–	–	–	–	–
Candaciidae	*Candaca discaudata*	*	*	*	*	*	*
	Candaca bradyi	*	*	*	*	*	*
Centropagidae	*Centropages calaninus*	–	–	–	–	–	–
	Centropages furcatus	*	*	*	*	*	*
	C.dorsispinatus Thompson	–	–	–	–	–	–
	C.tenuirernis Thompson	–	–	*	–	–	*
	Isias tropica sewell	–	–	*	–	–	*
Eucalanidae	*Eucalanus crassus*	*	*	*	*	*	*
	Eucalanus elongatus	*	*	*	*	*	*
	Eucalanus attenuatus	*	*	*	*	*	*
Euchaetidae	*Euchaeta corninna dana*	*	*	*	*	*	*
Lucicutiidae	*Lucicuta flavicornis*	*	*	*	*	*	*
Paracalanidae	*Paracalanus parvus*	*	*	*	*	*	*
Pontellidae	*Labidocera acuta*	*	*	*	*	*	*
	Labidocera pectinata	*	*	*	*	*	*
	Labidocera minuta	*	*	*	*	*	*
	Labidocera pavo	–	–	–	–	–	–
	Pontella danae	*	*	*	*	*	*
	Pontellopsis scotti sewell	*	*	*	*	*	*
	Pontellopsis macronyx	–	–	–	–	–	–
	Calanopia aurivilli	–	–	*	–	–	*
	Calanopia eliptica	–	–	*	–	–	*
	Calanopia minor	–	–	–	*	–	–
Pseudodiaptomidae	*pseudodiaptomus serricauda*	**	**	**	**	**	**
Scolecithricidae	*Scolecithrix danae*	*	*	*	*	*	*
Temoridae	*Temora tubinata*	**	**	**	**	**	**
	Temora stylifera	**	**	**	**	**	**
	Temora discaudata	**	**	**	**	**	**
CYCLOPOIDA							
Corycaeidae	*Copila vitrea*	*	*	*	*	*	*
Oithonidae	*Oithona brevicornis Giesbrecht*	–	–	–	–	–	–
	Oithona linearis Giesbrecht	–	–	–	–	–	–
Sapphiriniae	*Sapphirina ovatolanceolata Dana*	–	–	–	–	–	–

*: present; -: absent; **: abundant

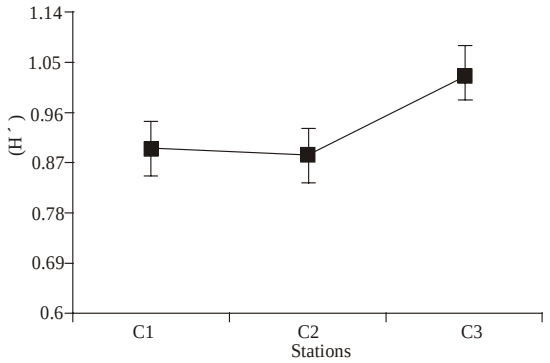

Fig. 2: Shannon Weiner index (*H'*) for copepods at cooum stations C1, C2 and C3.

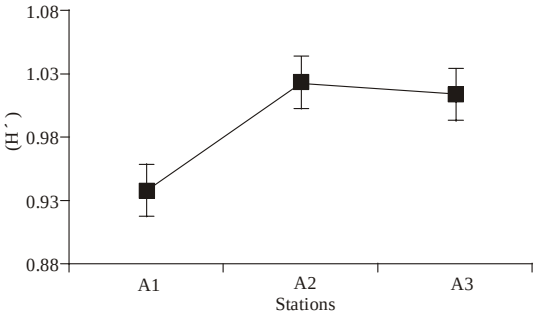

Fig. 3: Shannon Weiner index (*H'*) for Copepods at Adyar Stations A1, A2 and A3

composition. Scolecithricidae and Corycaeidae were absent in the near shore station A1. In middle station A2 family Pseudodiaptomidae (22%) showed the highest percentage composition and followed by Candaciidae and Temoridae (13%). Family Euchaetidae, Scolecithricidae (3%), Corycaeidae (1%) and Oithonidae (3%) showed the lowest percentage composition. Family Scolecithricidae was absent. Off shore station A3, Temoridae (16%) showed the highest percentage composition. Eucalanidae (1%), Scolecithricidae (3%) and Corycaeidae (3%) showed the lowest percentage composition. Family Scolecithricidae and Oithonidae were absent in the offshore station A3.

Shannon Weiner index (*H'*): The copepod diversity (Shannon Weiner index (*H'*) ranged from 0.883 to 1.025 at stations C1, C2 and C3. The highest copepod diversity was encounter at offshore station C3 (Fig. 2). The lowest copepod diversity was register at middle station C2. The Shannon Weiner index (*H'*) of the copepod diversity range varied between 0.938 and 1.023 at coastal stations A1, A2 and A3. The highest copepod diversity was encounter at middle station A2 and followed by offshore station A3. The lowest copepod diversity was register at near shore station A1 (Fig. 3)

DISCUSSION

Human settlement and developmental activities along the coastal regions have greatly accelerated environmental pressure on coastal ecosystem. A few coastal regions in India are constantly threatened by sewage and effluent discharges from the metropolis and industrialized areas. The coastal hydrograph of the Chennai coast is essential in the context of coastal pollution. This may lead to immense coastal environmental problems finally deteriorate the water quality.

Copepods, being the dominant component of the zooplankton community the species diversity used as an index in all biological monitoring studies to characterise the water quality (Gajbhiye *et al*., 1981). Copepods are known to select preferred habitats and hence their distribution may vary with species as well as seasonal fluctuations (Lalli and Parsons, 1997). .

In the present study the family Acartiidae was the dominant species and their population density was high in the near shore stations. The dominance of species *Acartia spinicauda* in the near shore waters can be considered as an indicator of pollution status (Gajbhiye *et al*., 1981). The absence of families like Oithonidae, Corycaeidae and Sapphiriniae during the study period may due to the discharge of effluents which might have prevented the survival of these species (Ramaiah and Vijayalakshmi, 1997).

The copepod diversity was decreased in the near shore stations due to the domestic sewages and industrial wastes. Similarly Madhupradap (1986) and Sivasamy (1990) reported that the east coast of India receive sewage and industrial wastes and as a result the plankton diversity was decreased in the near shore coastal waters. Eswari and Ramanibai (2002) reported that the low plankton diversity and abundance were mainly due to the waste inflow through various freshwater inputs from the Cooum and Adyar estuaries of Chennai coast.

CONCLUSION

The present study highlights the need for continuous monitoring of copepods diversity along the coast. The continues discharge of effluents to the coast ecosystem is vulnerable to all compartments of the food web. Awareness has been created if not immediate, definitely block or alert the input from industrial area. The knowledge gained through the work stress that further research work in this line should not be neglected.

ACKNOWLEDGEMENT

We are thankful to National Institute of Ocean Technology (NIOT) - Chennai, to providing the vessel (CRV Sager Purvi) for the plankton sample collection. M.S (author) is grateful to the University of Madras for the research fellowship under the UGC- JRF Research fellowship in Science for Meritorious programme.

REFERENCES

Beyst, B., D. Buysse, A. Dewicke and J. Mees, 2001. Surf zone hyperbenthos of Belgian sandy beaches: Seasonal patterns. Estuarine, Coastal Shelf Sci., 53: 877-895.

Bowman, T.K. and L.G. Abele, 1982. Classification of the Recent Crustacea. In: Abele, L.G. (Ed.), Systematics, the Fossil Record and Biogeography, Academic Press, New York, pp: 1-27.

Eswari, Y.N.K. and R. Ramanibai, 2002. Distribution and abundance of phytoplankton in the estuatine waters of Chennai, Southeast coast of India. J. Mar. Biol. Ass. India, 44(1-20): 205-211.

Gajbhiye, S.N., J. Ram and B.N. Desai, 1981. Zooplankton distribution in the polluted environment around Bombay. Indian J. Mar. Sci., 20(1): 43-48.

Kasturirangan, L.R., 1963. A Key to the Identification of the More Common Planktonic Copepod of Indian Coastal Waters, Publication No 2. In: Pannikar, N.K. (Ed.), Indian National Committee on Oceanic Research, CSIR, New Delhi, pp: 125.

Lalli, C.M. and T.R. Parsons, 1997. Biological Oceanography an Introduction. 2nd Edn., Butterworth-Heinemann, Oxford, pp: 82-84.

Madhupradap, M. and P. Haridas, 1986. Epipelagic calanoid copepods of the northern India. Oceanol. Acta, 9: 105-107.

Ramaiah, N. and K.N. Vijayalakshmi, 1997. Distribution and abundance of copepods in the pollution gradient zones of Bombay Harbour-Thana-creek-Bassein creek, west coast of India. Ind. J. Mar. Sci., 26: 20-25.

Sampey, A., A.D. McKinnon, M.G. Meekan and M.I. Mc Cormick, 2007. Glimpse into guts:overview of the feeding of larvae of tropical shore. Mar. Ecol. Prog. Ser., 339: 243-257.

Severini, M.D.F., S.E. Botte, M.S. Hoffmeyer and J.E. Marcovecchio, 2009. Spatial and temporal distribution of cadmium and copper in water and zooplankton in the Bahia Blanca estuary, Argentina. Estuarine, Coastal and Shelf Science, pp: 1-10.

Shannon, C.E. and W. Weiner, 1963. The Mathematical Theory of Communication. University of IIinois Press, Urbana, pp: 117.

Sivasamy, S.N., 1990. Plankton in relation to coastal pollution at Ennore Madras coast. Ind. J. Mar. Sci., 19: 115-119.