International Journal of Science, Environment and Technology, Vol. 3, No 1, 2014, 140 – 147

ISSN 2278-3687 (O)

A STUDY ON THE POPULATION STRUCTURE OF CLAMBDS IN MULKY ESTUARY, MANGALORE, KARNATAKA

N. Sivashankar[1] and Gangadhara Gowda[2]

Associate Professor (Fisheries), College of Agriculture, Bheemareayanagudi-585287, Karnataka, India

Department of Fisheries Environment and Ecology, College of Fisheries, Mangalore, Karnataka India

Email: sivareddyn@rediffmail.com

[*The paper forms part of the Ph.D. thesis submitted to the Karnataka Veterinary Animal and Fisheries Sciences University, Karnataka]

Abstract: A study was conducted to know the community structure of the clam beds of Mulky estuary in Mangalore. The seasonal and spatial variations in the qualitative and quantitative composition of the macrobenthic population indicated the dominance of mollusca, polychaetes and crustaceans. Higher populations were observed during the pre monsoon and post monsoon season. The population density of macrobenthos varied between 228 to 915 no/m^2. Four species of polychaetes were recorded in clam beds in which *Seballaria* sp and *Dendroneries* were the most abundant. Crustaceans were represented by amphipods, isopods, barnacles and crabs. Molluscan population were represented by bivalves, and gastropods. Four species of bivalves were recorded in Mulki estuary among which, *Meretrix casta and Paphia malabarica* were the dominant. Bivalves contributed significantly to the macrobenthic population.

Keywords: Clam beds, macro benthos, monsoon seasons.

Introduction

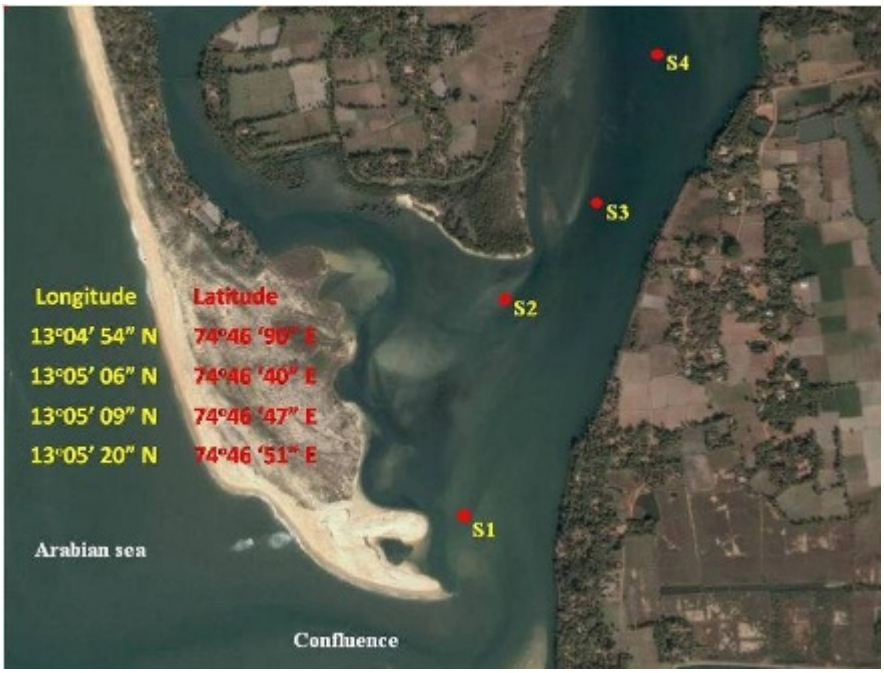
Bivalve molluscs such as oysters, sea scallops, clams, and soft-shell clams, often aggregate in dense groupings, forming a habitat type known as shellfish beds. Shellfish beds provide many habitat services including refuge for smaller organisms such as polychaete worms, juvenile crabs, snails, and sea stars. Additionally, organisms such as slipper shells, sponges, and algae can attach to shells' hard surfaces in areas otherwise dominated by soft sediments. Shellfish beds provide many important ecosystem services. The concepts of benthic community were expanded by Petersen (1913, 1918), Mollander (1930) and Thorson (1955a, 1957). They suggested that a community is any assemblages of species and individuals, as an organized unit that species composition and their frequency show regular changes in time and space, and that these numerical components keep a certain balance through a definite inter specific food relationship.

*Received Dec 12, 2013 * Published February 2, 2014 * www.ijset.net*

Because of environmental complexity in the habitat, benthos in the shallow waters show various living manners, though all of them occupy a position at or near the end of a food chain items in marine ecosystems. Benthos play an important role in the recycle or regeneration of nutrients between pelagic and benthic divisions, i.e., without such larger animals as megalo-benthos they form an important source of the demersal fishes which work an indispensable role, in trophic levels and also provide food directly or indirectly through the detritus food chains for various micro consumers in a lower trophic level. Thus, benthos with a role of this kind have a certain domain as a habitat according to their proper manners and form a community in which certain species will occur together in a prescribed areas and the response of the benthic communities to the environmental conditions in the gradient will give not only the important clue to study the characteristics of the organic matter flow in the bottom area (Sbigeru 1982). Hence this study has been carried out to know the community structure of the clam bed in Mulky estuary

MATERIALS AND METHODS

The confluence of the Mulki and Pavanje rivers with the Arabian Sea leads to the formation of Mulki estuary. The Mulki estuary (Lat. 13° 4’ N and Long. 74° 17’ E) is situated at about 45 km north of Mangalore. The estuary is connected to the sea throughout the year and is subjected to tidal influence to the tune of 1.86 m affecting the water to a length of 6.0 km in Mulki river. The bottom is generally sandy with muddy stretches in the deeper areas. Four stations have been selected in the predetermined clambeds (Image 1).



In Mulki estuary, the clam shell deposits extend up to a depth varying between 0.5 and 1 foot below the live clam bed level. The shell deposits are of recent formation and are not fossilized. The clam beds occur in areas at a water depth of 0.5- 1.5 m during low tide where live clams formed 57% of the shell layer covering an area of 0.27 sq. km.

Samples were collected at fortnightly intervals (August, 2007-July, 2008) from the selected stations in Mulki estuary. The samples were collected during low tide by using a quadrant having an area of 0.16m^2, upto a depth of 10 cm and were used for further analysis. For collection of macrobenthos-the associated macrofauna, sediment samples were sieved through a 0.5mm. mesh size sieve and the fauna retained in the sieve was preserved in 5% buffered formalin with Rose Bengal solution for further analysis on the distribution, population (no./m^2) and species composition of benthic fauna associated with the clambeds.

Results and Discussion

In the present investigation, three major groups were recorded which belonged to mainly to molluscs, polychaetes and crustaceans were found more frequently with greater numbers. The other organisms occurred sporadically.

The numerical abundance of macrobenthic organisms varied between stations and months. The percentage contribution of polychaetes varied from 3.02 to 21.28%, whereas crustaceans varied from 1.05 to 3.22%. The molluscans were most dominant and represented by gastropods, bivalves. The gastropods percentage contribution varied from 3.17 to 41.17% in the clambeds the percentage contribution of bivalve varied from 38.87 to 58.68 %. The other miscellaneous forms varied from 4.44 to 5.97% (Fig. 2).

The percentage contribution of macrobenthos in the clambeds were found to be varied in space and time (Fig. 2). During monsoon season, bivalves and gastropods formed 44 and 26 % of the total macro benthos respectively. Between different months bivalves were recorded not less than 30 % in almost all the months followed by gastropods. In post-and premonsoon seasons similar trend was noticed. Bivalve species, *Meritrix casta* and *Paphia malabarica* were the dominant one. In gastropods, the dominant group was *Cerithedea fluviatilis* in almost all the months. The spats (*M.casta and P.malabarica*) formed as the third contributor of benthic population varied between varied 3 and 12 % .The benthos in the clambeds were dominated by bivalves, gastropods and spats (34.14 to 37.16; 24.86 to 27.80 and 14.42 to 22. 54 %) respectively (Fig 2).

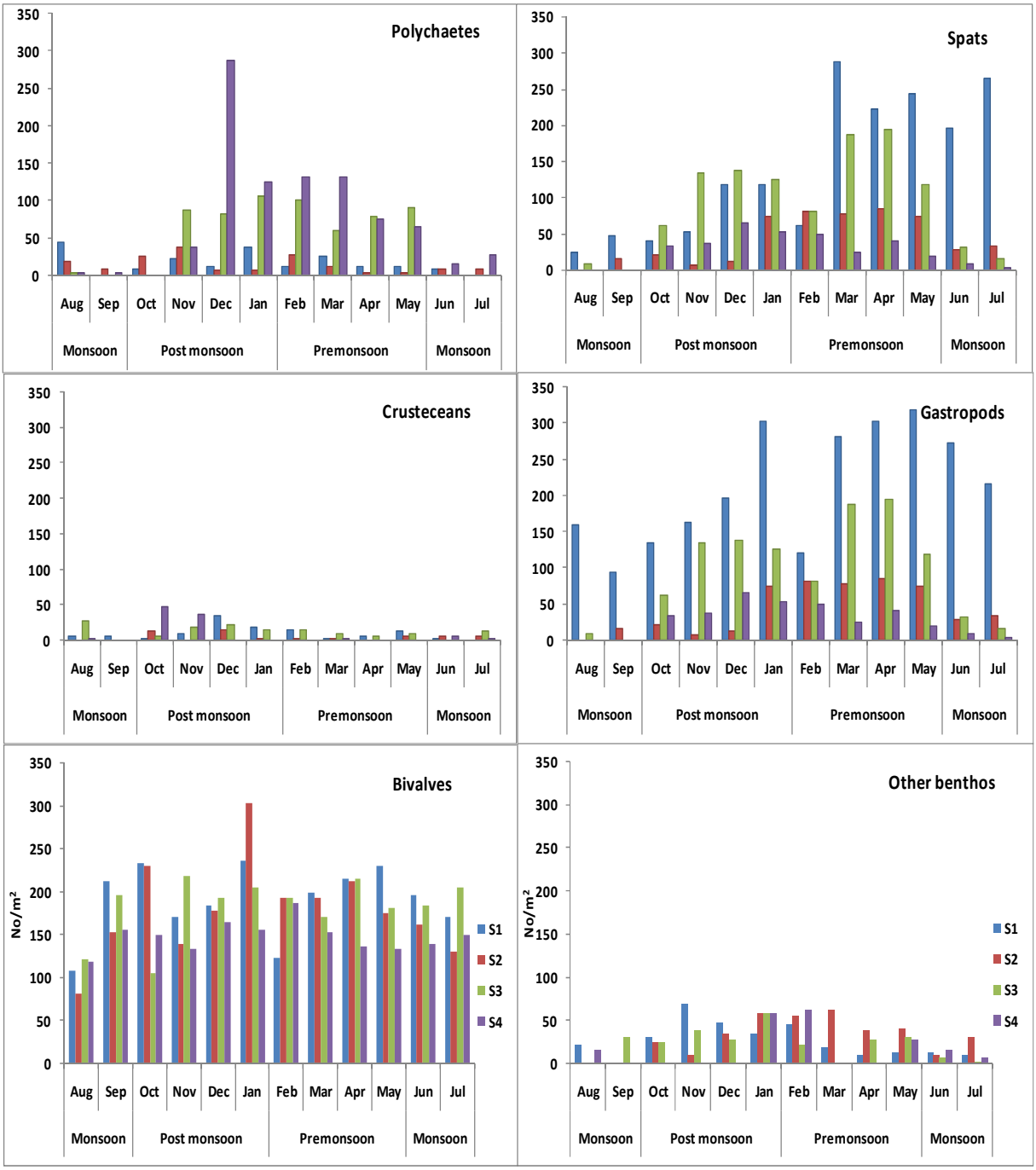


Fig. 2 Percentage distribution of different macrobenthos in the clam beds

The population of polychaetes among the seasons varied from 1 to 5 % in monsoon season; 2 to 18% in post monsoon season and 0 to 1% in pre monsoon season respectively. The most dominating species of polychaetes in the clambeds were *Dendroneneries arborifera.*

In the backwaters and estuaries of Cochin and Vembanad lake along the west coast of India, observed the dominance of polychaetes in the benthic community (Ansari 1974, Kurian *et al.* 1975, Kurian 1971, Pillai 1977, Ansari 1977, Sunil Kumar 1995, Kumar 1997. Sunilkumar 2002). Ramachandra *et al.* (1984) recorded higher number of *Dendronereis arborifera* and

Sabellaria cementarium in the polychaete community of Mulki estuary along west coast of India. In the present study also, similar results have been noticed.

The dominant crustacean species observed were *Corophium sp* and *Gammarids.* The barnacles observed during the period were found to be settled on small pebbles and shells of molluscs. The monthly distribution among the stations was zero to 21.88 % with a mean of 34.80±9.77 no/m^2.

Studies carried in the estuaries of Mandovi-Zuari, Coleron indicated the dominance of crustaceans during post monsoon. (Ansari *et al.* 1986, Prabhadevi 1994). However, Prabhu *et al.* (1993), Mohan Kumar (1999) and Shanthanagouda (2001) did not observe significant contribution of crustaceans in general and amphipods in particular to the total macrobenthos in the Gangolli, Mangalore coastal waters and Nethravati-Gurupur estuaries respectively. In the present study also, the contribution of crustaceans was negligible to the total macroenthos in Mulki estuary.

The gastropods in the clambeds ranged from 24 to 32% during the monsoon season; 22 to 28% in premonsoon months and 22 to 28 % in post monsoon months. The most dominant species are *Cerithedea fluviatilis, Neritina oualaniensis Nerita pollita* and *Eunaticina papilla* Studies conducted in Cochin backwaters, Mulki estuary, Kali estuary indicated the higher contribution of molluscs to the total macrobentic community in the calm beds (Ansari 1977; Ramachandra *et al.* 1984 and Bhat and Neelakantan 1988).

In the present study, the bivalve population consisted of spats and the adult clams. The clams were mainly dominated by only two species *viz.,Meretrix casta* and *Paphia malabarica* in all the stations. The percentage contribution of clams towards total population of varied from 47.93 to 67.71% during monsoon season, 34 to 48 % in post monsoon season and 34 to 37 % in pre monsoon season.

Ramachandra *et al.,*(1984) documented low number of molluscs during monsoon and high population during post and pre monsoon in Mulki estuary. Devassy *et al.,* (1987), Mohan Kumar (1999) observed the peak abundance of molluscs during post monsoon season. Shanthanagouda (2001) observed dominance of molluscs during post and pre monsoon season. In the present study also, similar trend was noticed, viz dominance mollusca in the post and pre monsoon season.

Sand tubes, mud tubes and egg cases formed the bulk of miscellaneous forms. During monsoon season the density of these varied from 3 to 4 no/m^2 in monsoon season; 5 to 10 no/m^2 in post monsoon season and 3 to 10 no/m^2 pre monsoon season respectively.

Correlation studies on the influence of different environmental parameters on the distribution of benthos indicated that the polylchetes had positive relationship with san, clay and very fine sand indicating its preference. A positive correlation was observed with respect to gastropods with all the parameters except ammonia. The molluscs showed positive correlation with parameters like pH, dissolved oxygen chlorophyll and with very fine sand (Table 1)

Conclusion

It can be concluded that, the community of clam bed were comprised of Polychetes, Gastropods, Molluscs, Crustaceans, Spats of clams viz *Metretrx casta*, *Paphia malabarica*.

References

[1] Ansari, Z.A., 1974. Macrobenthic production in Vembanad lake. *Mahasagar,* **6**(3-4): 197-200.

[2] AnsarI, Z.A., 1977. Macrobenthos of the Cochin backwaters. *Mahasagar,* **10**(3-4): 169-171.

[3] Ansari, Z.A., Ingole, B.S., Banerjee, G. and Parulekar, A.M.,1986**.** Spatial and temporal changes in benthic macrofauna from Mandovi and Zuari estuaries of Goa, west coast of India. *Indian J. Mar. Sci.,* **15**: 223-229.

[4] Bhat, U.G. and Neelakantan, B., (1988). Environmental impact on the macrobenthos distribution of Kali estuary, Karwar, Central west coast of India. *Indian J. Mar. Sci*., 17(2): 134 - 142.

[5] Kurian, C.V. 1972. Ecology of benthos in the tropical estuary. *Proc. Indian Nat. Acad.* **38 B** (3) & (4): 154-163.

[6] Kurian, C.V., Damodaran, R. and Antony, R., 1975. Bottom fauna of the Vembanad lake. In**:** Kurian C.V. (Ed.), Contribution to estuarine biology, *Dept. Mar. Sci. Univ.;* Cochin. PP. 987-994.

[7] Kumar, R.S., 1997. Vertical distribution and abundance of macro-invertebrates in an estuarine mangrove biotope, southwest coast of India. *Indian J. Mar. Sci.,* **26**(1): 20-25.

[8] Mohan Kumar, B., 1999. Distribution of macrobenthic organisms in relation to the selected sediment characteristics in the Arabian Sea off Chitrapur receiving industrial effluents. M.F.Sc., Thesis, University of Agricultural Sciences*,* Bangalore, India.

[9] Molander, A.R. 1930. Animal communities on soft bottom areas in the Gullmar Fjord. Kristinebergs Zoologiska Sta., 1877-1927, 2, 1-90

[10] Nakao Sbigeru, 1982 Community structures of the macro-benthos in the shallow waters in northern japan. Memoirs of the Faculty of Fisheries Fokkaido University, 28(2): 225-304.

[11] Petersen, C.G. Joh. 1913. Valuation of the sea, II. The animal communities of the sea bottom and their importance for marine zoogeography. Rep. Danish BioI. Stat., 21, 1-44.

[12] Petersen, C.G. Joh. 1918. The sea bottom and its production of fish-food. A survey of the work done in connection with the valuation of the Danish waters from 1883-1917. Ibid., 25, 1-62.

[13] PrabhadevI, L., 1994. Ecology of Coleroon estuary: studies on benthic fauna. *J. Mar. Biol. Assoc. India.,* **36** (1) & (2): 260-266.

[14] Prabhu, H.V., Narayana, A.C. and Katti, R.J., 1993. Macrobenthic fauna in nearshore sediments off Gangolli, west coast of India. *Indian J. Mar. Sci.,* **22**: 168-171.

[15] Ramachandra, U., Gupta, T.R.C. and Katti, R.J.,(1984. Macrobenthos and sediment characteristics of Mulki estuary, west coast of India. *Indian J. Mar. Sci.,* **13**: 109-112.

[16] Shanthanagouda, A.H., 2001. Macrobenthos in relation to sediment characteristics in Nethravati-Gurupur estuary. M.F.Sc. Thesis, University of Agri, Sci., Bangalore, India.

[17] Sunil Kumar, R., 1995. New record of five Annelids (Class: Polychaeta) from the mangrove habitat of the south west coast of India. *J. Mar. Biol. Assoc. India.,* **41**(1&2): 116-118.

[18] Sunil Kumar, R., 2002. Biomass, horizontal zonation and vertical stratification of polychaete fauna in the littoral sediment of Cochin estuarine mangrove habitat, south west coast of India. *Indian J. Mar. Sci.,* **31**(2): 100-107.

[19] Thorson, G. 1955a. Modern aspects of marine level-bottom animal communities. J. Mar. Res., 14, 387-397.

[20] Thorson 1957. Bottom communities (sublittoral or shallow shelf). Gwl. Soc. Amer. Mem., 67 (Treat. Mar. Ecol. Palaeoecol., vol. 1. Ecology, ed. by Hedgpeth, J.W.), 461-534.

Table 1: Correlation coefficients of total fauna in relation to different physico- chemical parameters in the clambeds.

Populations	Water Temp	Sediment Temperature	Water pH	Sediment pH	Salinity	Interstitial Salinity	Dissolved Oxygen	Ammonia	Chlorophyll	Susp.solids	Organic Carbon	Plankton	Sand	Silt	Clay	V.Coarse sand	Coarse sand	Medium sand	Fine sand	V.fine sand
Total Benthos	0.425	0.551	0.671	0.630	0.717	0.749	0.678	-0.614	0.447	0.749	--	--	--	--	-	--	--	--	0.481	1.00
Polychaetes	--	--	--	--	0.398	0.445	-	--	--	0.445	--	--	-0.506	0	0.43	--	--	--	0.562	0.545
Crustaceans	--	--	--	--	--	--	--	--			--	--	--	--	--	--	--	--	--	--
Bivalves	--	--	0.412	--	--	--	0.410	--	0.384		--	--	--	--	--	--	--	--	--	0.405
Total spats	--	--	--	0.421	0.398	0.419	0.328	--	--	0.419	--	--	--	0.455	---	--	--	--	--	0.612
Gastropods	--	0.328	0.405	0.435	0.457	0.447	0.382	-0.381	0.363	0.447	--	--	--	---	---	--	--	--	--	0.609
Miscellaneous	--	0.397	--	--	--	0.391	--	-0.460	0.405	0.391	--	--	---	---	---	--	--	--	--	--
M.casta spats	0.381	0.423	0.436	0.562	0.511	0.542	0.431	-0.428	0.323	0.542	--	--	--	---	---	--	--	--	--	0.741
P.malabarica spats	0.347	0.420	0.448	0.542	0.516	0.537	0.460	-0.405	--	0.537	--	--	--	---	---	--	--	--	--	0.796
M.casta	--	--	--	--	--	--	--	--	0.305	--	--	--	-0.637	---	-0.614	--	0.545	--	--	0.183
P.malabarica	--	--	--	--	--	--	--	--	--	--	--	--	-0.729	---	0.671	--	-0.504	0.05	0.404	0.082