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International Journal of Current Research
Vol. 4, Issue, 11, pp. 337-342, November, 2012

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

CORRELATIVE STUDY ON POLYCHAETE ASSESSMENT ASSISTANCE OF ENVIRONMENTAL PARAMETER IN LITTORAL AREAS OF VELLAR ESTUARY, SOUTHEAST COAST OF INDIA

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ARTICLE INFO

Article History:
Received 11th August, 2012
Received in revised form
19th September, 2012
Accepted 21th October, 2012
Published online 30th November, 2012

Key words:
Polychaete,
Trace metals,
Vellar estuary,
Pollution.

ABSTRACT

In the present study we evaluate the intertidal distribution of polychaete communities allied with the physicochemical parameters and to impact on the ecosystem health to presence of heavy metals contents are influenced with occurrence of the polychaetes. Totally 828 of individuals belonging to eight polychaete genus were collected from the four dissimilar stations of around Vellar estuaries. Among this populations ranged from 8.81 - 17.27%. In terms of species individuals establish all the station varied between 1.57 (S4) - 6.03 (S3) for the responsibility of physicochemical parameters. The sediments compositions of ranged 40±5.50 - 71±0.57, silt 23±0.57 - 37±1.15 and clay 5.6±0.66 - 28±9.2 in the all station. Entire sampling site Fe was maximum and Cd was minimum contents are determine to substantiating the conditions of the ecosystems. The multivariate analyses are concluding the linkage of these factors and animal abundant through the parallel findings and this level was assist to accrue the availability of polychaetes distribution and the environmental variables are strongly correlated with animal population ($P < 0.05$), in conclusion the species distribution are determine the concentrations of trace metal and defend the ecosystems.

INTRODUCTION

Knowledge on the dynamics of coastal systems through the study of marine communities allows the assessment of ecological and environmental conditions. Globally environmental pollution is a topical disaster for conditions of ecosystem health. In pertaining to the monitoring purpose most of regulation was followed, biologically pollutants were decomposed through the animal mechanisms specifically, polychaetes are considered as good indicators of environmental perturbations because they are the most abundant species and rich component of marine benthos, often comprising more than one-third of the total number of macrobenthic species (Belan, 2003) In benthic data is regularly collected worldwide to assess the environmental quality of marine ecosystems (Gray and Elliott, 2009), by comparing proportions of species tolerant or favor by pollution, the species representative of unpolluted conditions (Tataranni and Lardicci, 2010).The domestic pollution of various gratuitous material effluent, spillage of ore dust and heavy industrial pollution to have an effect of marine ecosystems and animals. Estuaries are province of high productivity of invertebrates paradoxically, represent habitats at risk from anthropogenic contamination via rivers draining catchments with industrial development and dumping of aquaculture waste, the source of the pollution origin from river run off, which has profound influence the fauna of ecosystems this intricate problem will be further worsen when the physico chemical variable of the different pollution and time interaction are added in combination to the system (Geffard *et al*, 2005). Generally polychaetes are characterized up to 80 percentages of high species richness and diversity in marine sediments, in terms of numbers and individual significant groups in marine (Hutchings, 1998, Knox, 1977). To established the ability of polychaetes functioned a important role in the benthic communities (Hutchings, 1998) and they have been shown to be good indicators and extensively used in coastal studies for monitoring purposes especially in soft-bottom habitat and species richness of community patterns in benthic invertebrate assemblages (Van Hoey *et al*., 2004), It has been utilized as a pollution indicator of the environment and has a high level of tolerance to adverse effects of pollution and natural perturbations. Polychaete distribution related to the environmental factors are a vital constituent, sediment nature contribute a paramount role in the benthic ecology. Besides this burrow dwelling animals are functioned an important role in organic matter decomposition and nutrient cycling processes in sediments (Aller, 1982) and it comprise a vital constituent of the higher consuming animal of food web. Mainly most of the estuarine environments are acts as a reservoir for nutrients and heavy metals and many of aquatic systems, the benthic faunal assemblage are elevated on the nature of substratum. Hence, a comprehensive knowledge on the sediment composition is a prerequisite and inevitable one to understand the benthic ecology (Sebastin Raja, 1990). Extensively studied in Vellar estuary related to the

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environmental parameters and faunal assemblage, the study of intertidal benthic fauna of polychaetes contribute high diversification in Indian estuarine waters around, 152 species recorded around the east coast of Tamilnadu 119 number of species, in vellar 98 species can identified (Ajmalkhan and Murugesan, 2005). In intertidal system of polychaetes in vellar estuary Balasubramaniyan (1964) made comprehensive study, while compare to the offshore assemblage in Parangipettai coast recently limited studies have been done(Kudu *et al*., 2010).Aim of the present study is to determine the environment quality of four different intertidal area of Parangipettai waters and analyze a physical chemical parameters and sediment characteristics with assistant of the polychaete composition and abundance of ecological indices, and the heavy metal concentration are correlate the polychaete distribution of animal availability and to know the species surveillance of different areas.

MATERIALS AND METHODS

Description of Study Area

The sampling sites are situated along the Parangipettai through the Vellar estuary in the intertidal areas from the seashore towards channel of estuary. The estuary has a variety of biotopes like backwaters, mudflats and mangroves; it joins the Bay of Bengal. During the study four stations were selected from the Mouth of Pudupettai (S1-11°51.674'N 79°76.5177'E) was located in the seashore directly connect to intertidal mud flat. The second station Annankovil (S2 - 11°50.152'N 79°77.162'E) this station oil and other pollution components were logged, the station three is Jetty (S3-11°48.954'N 79°76.427'E) dense growth of mangroves, the fourth station is Railway Bridge (S4- 11°47.784'N 79°73.191'E), downstream from the seashore, this site occupied domestic sewage and aquaculture ponds waste(Fig.1).

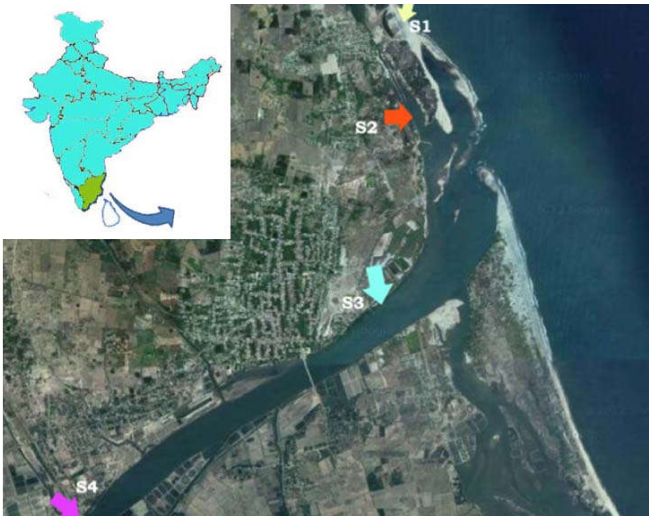


Fig. 1. Showing four different sampling sites

Sampling strategy

Collection of the samples

Environmental variable was collected during low tide were done for six months interval (April - September 2011) along the four stations. The physico chemical parameters like temperature were estimated by centigrade thermometer. Dissolved oxygen was estimated by a Winkler's method. On occasions, salinity was determined by Refractometer corresponding values for salinity was noted from Knudsen's Tables. The pH was measured with (Eco test pH1) pH pen. In texture analysis approximately 150 g of wet sediment sample from each station was taken for sediment analysis. The samples were taken to the laboratory and dried at 60°C in an oven for further analysis. The sediment texture was analyzed and Mean Particle Diameter was calculated with the help of particle size analyzer (Sympatec particle size analyzer, Germany). The sand, silt and clay fractions were expressed in percentage and the MPD values were expressed in microns (µ). Total organic carbon content (TOC) was measured by chromic acid oxidation method followed by titration with ammonium ferrous sulfate (El Wakeel and Riley, 1956).The physico-chemical parameters have been expressed as follows-salinity (Psu), Temperature (°C) and dissolved oxygen (ml/l). Sediment characteristics were mentioned as follows: textural characteristics (%), total organic carbon (mg/g) and mean particle diameter (µm).

Extraction of polychaete species

Sediment samples were collected from each station by randomly, the sample was washed through 500 µm mesh sieve in filtered running water to clear adhering sediment. All the animals were sorted according to different taxa and were preserved in 4% formalin and stained with rose Bengal for further investigation. The taxonomic identification of polychaete was based primarily on the keys of Day, 1967 and Favel, 1953.Data were analyzed using statistical packages of Origin 6.1 and SPSS 11.1 to explain inter and seasonal variations among the physico-chemical parameters. Correlation coefficients between various physico-chemical parameters, F values were calculated to determine the differences in the physico-chemical parameters between stations correlate on the species distributions.

RESULTS

Environment variables

Hydrography

For each site samples were collected to estimates of the mean values of physico chemical parameters and sediment variables that could reasonably influence by the distribution of polychaetes. The environmental variables of the water temperature showed a clear two seasonal pattern (Fig. 1a) ranged from 38.1±0.12 to 28.8±0.16°C in station 1, with the highest values registered in summer, and the lowest in Premonsoon, respectively the results varied station 3, 4 and 2. Water salinity had constantly marked with chronological pattern, with mean values ranging from 34.3±0.152 to 25.4±0.24 psu in order Station 1, 2, 3 and 4. (Fig.1b) Where as the water pH was varied from 7.8±0.05 - 6.7±0.120 in regulation of the station 4, 2, 1 and 3(Fig.1c), respectively the level of dissolved oxygen ranged from 5.3±0.05 - 3.2±0.05ml/l (Fig.1.d).

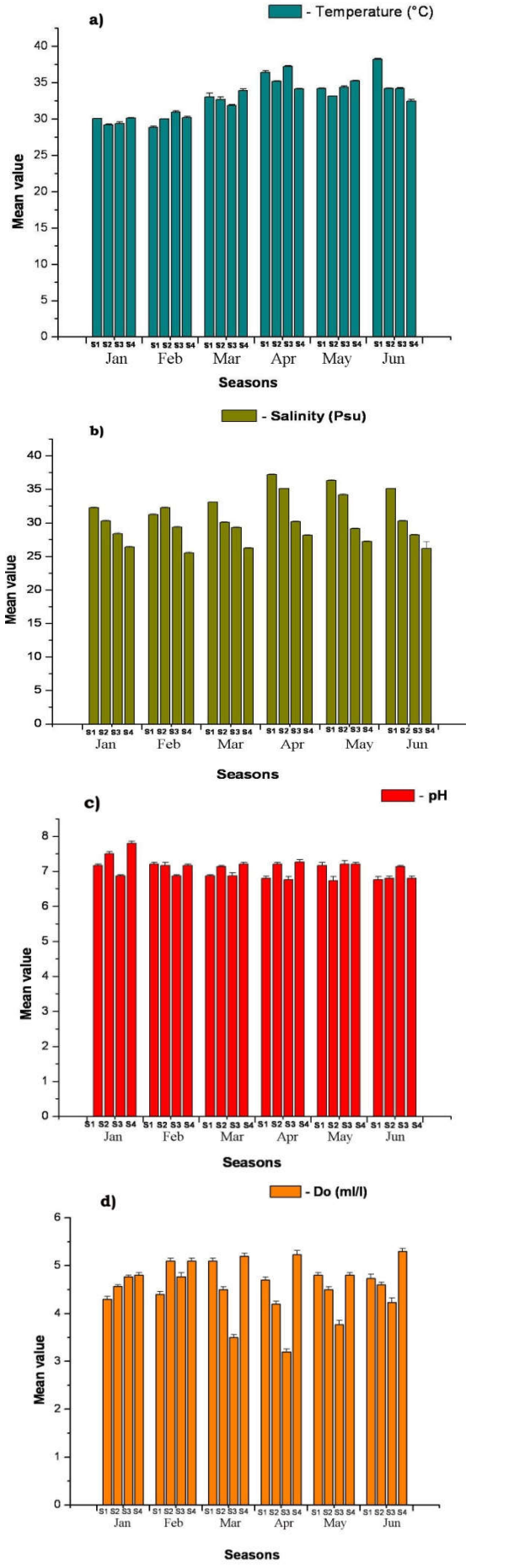


Fig. 2. Showed enviromental variable of a) Temperature b) Salinity c) pH d) Dissolved Oxygen

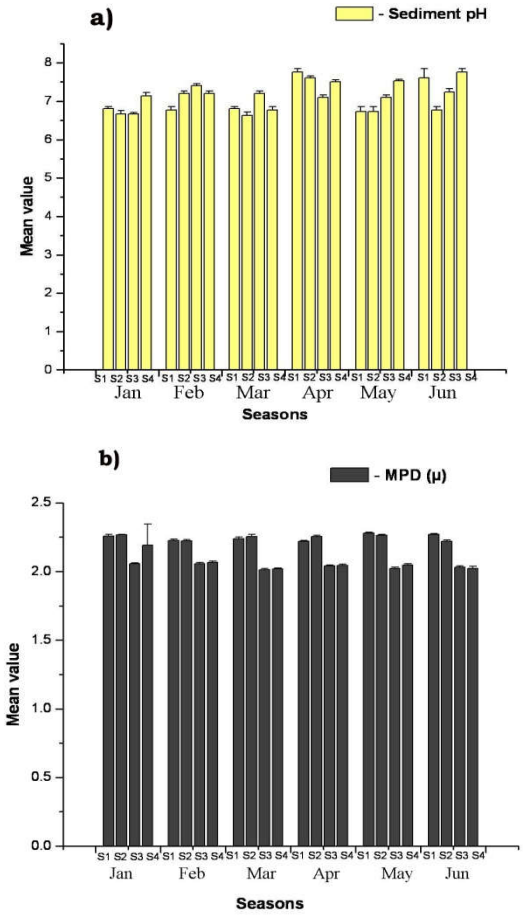
Sediment analysis

The result of sediment composition mainly composed by inadequately sand with fine fractions (i.e., silt + clay) ranging from 5 to 72% in summer, whereas in Pre monsoon ranged from 4 to 69% all though, the fraction were, consequently decrease with other station, (Table.1) apart from the station 3 and station 4 percentage of sand were high in Station and 2. Sediment pH of the intertidal bottom varied between 6.6±0.03 - 7.7±0.08 in order of the station it ranged station 1, 4, 3 and 2(Fig.2a). The total organic carbon (TOC) during study period varied from 3.7±0.05 - 9.32±0.24 mg/g, the composition value ranged from station 3, 4, 2 and 1(Fig.2b).The mean particle diameter (MPD) varied from 2.01±0.01 - 5.14±1.4 the range varied from the levels of station 4,2, 3 and 1.(Fig.2c)

Table. 1. Range of sediment composition in four stations

Type	Summer		PreMon		Mean value	
	Min	Max	Min	Max	Summer	PreMon
Sand	29	72	28	69	40±5.50 - 71±0.57	31.6±3.17 - 65.6±1.76
Silt	22	39	29	39	23±0.57 - 37±1.15	31.6±1.76 - 37.3±1.66
Clay	5	46	4	31	5.6±0.66 - 28±9.2	4.6±0.66 - 28.3±1.4

In the present study the levels of heavy metals (Fe>Cr>Cu>Zn>Cd) followed by Station, 4, 3, 2 and 1 were showed the concentration of Fe was observed to be higher than the other metals where as lower concentration is Cd. The Fe ranged from in the unit of µg/l 802 (S1) to 9875 (S4) followed by remaining 4 metals minimum were observed Station, 2 and 1 whereas maximum were constitute were observed at station 3 and 4.(Fig.4)



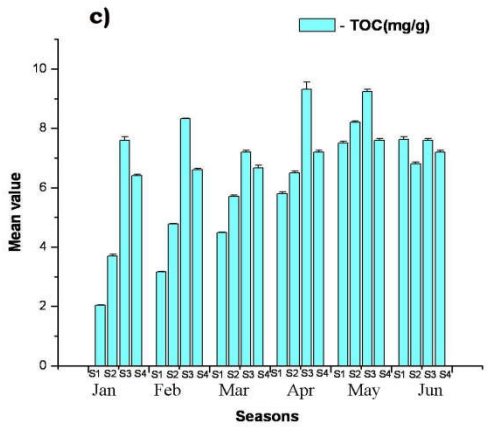


Fig. 3. Showed senimentology of a) Sediment pH b) Mean Particle Diameter c) Total organic carbon

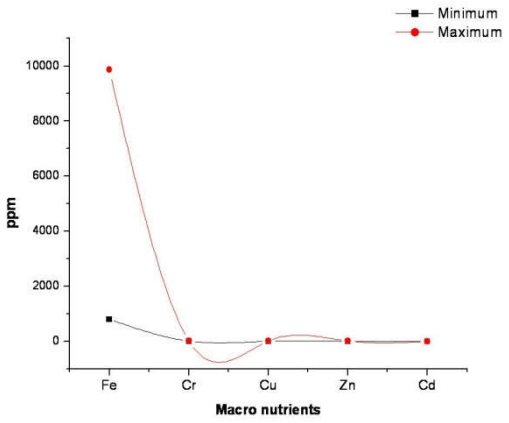
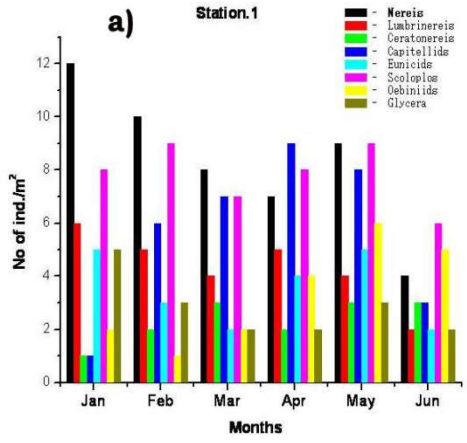
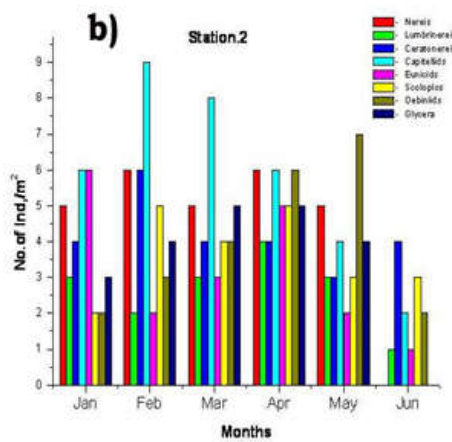
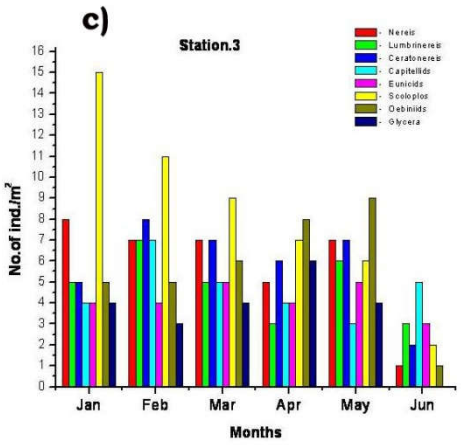


Fig. 4. Trace metal content in all the four station







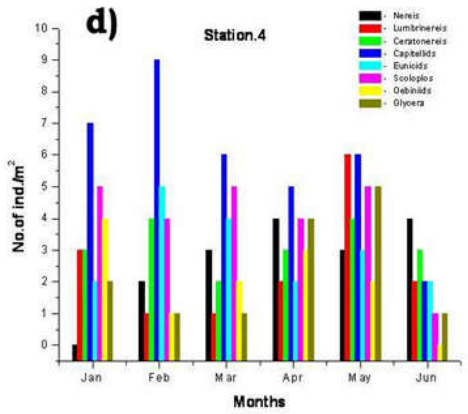


Fig. 5. Abundance of polychaetes a) Pudupettai(S1) b) Annankovil(S2) c) Jetty(S3) d) Railway Bridge (S4)

Faunal compositions

The results clearly indicate the occurrence of diversity and evenness values for the species groups of annelids found during the sample period at all the four stations. A total of 828 individuals belonging to 8 groups were collected, represented by Scoloplos (17.27%), Capitellids (15.94%), Nereis (15.45%), *Ceratonereis* sp (11.23%), Oebiniids (10.86%) Lumbrinereis Sp(10.38%), Eunicids (10.02%), Glycera (8.81%). The samples were processed to understand the numbers contributing to the total of group's minimum number of *Orbiniids* family was recorded month of May – Jun in St.2 and St.4 maximum species was observed Scoloplos in all the four stations at Jan - Mar. Results of the correlation coefficient matrix total polycheates relation with the physical parameters and sediment particles such as correlations and regression analysis of polycheates showed the positive correlated with the salinity(r=863) and pH(r=854) in Station1, 2 and 4, respectively (r=844) and pH(r=843), (r=829) and pH(r=883) between the polychaetes with Nereis and Glycera correlated at (P>0.01) level, whereas dissolved oxygen is negatively correlated.

DISCUSSION

In macro faunal population of various reasons can attribute their distribution and abundance of parameters having limited influence on the number of species (Muss, 1967). Present study showed from the intertidal polychaete survey of Vellar estuary indicates the species distribution. The declining of species availability towards the seashore various factors have

influenced by the dominating factors. Holland *et al*., (1977) suggested that the sediment load resulting from freshwater run off might also be a factor for the low diversity rather than salinity changes. The low diversity values observed in the present study could be recognized to the salinity changes caused by the monsoonal flood and also the sediment shift by the tidal action caused by flood arising out of monsoonal downpour hence the study was proved the maximum animals were observed in station 3 related to above suggestion the river run off and is low due to the protection of mangroves such preponderance of polychaetes in Parangipettai water reported Balasubramaniyan, 1964; Srikrishnadhas and Ramamorthi, 1982 and Srikrishnadhas *et al.,* (1987) and 123 species has been described around this area. Present study Nereis*,* capitellids and Scoloplos are the most dominant species; this species could tolerate wide variations physico chemical parameters as far upstream of shore (Aruljothiselvi 1998)

The results of environmental variables are showed some significant trends with species individuals mostly affected by physical factors increasing linearly with relative tidal range and decreasing with increasing average grain size (Rodil and Lastra 2004).In consequence probably only the most basic predictions can be made, polychaete densities are lower in exposed sandy beaches and in coarser subtidal sediments than in finer sediments (Knox, 1977). Brinkhurst (1987) stated that the sediment particle size and organic content were the principle factors affecting species composition. In correlation matrix of the MPD vale positively correlated with obeinids population. Present study, the polychaetes composition and numerical abundance in all the stations are high except station2 (Railway Bridge) and station 4 Annankovil. In station 2 is connect with near shore water recently canal dredging fishing harbor work have been under process for the ecosystem disturbance the animal availability was low. Whereas in station 4 is mainly lesser salinity zone (Aruljothiselvi 1998) these factors are the reason for declining of some of polychaete groups assemblage. Huge amount of domestic and shrimp farm discharges were dumped this region the metal concentration was high.

Dominance of polychaetes density and species composition are diverse in ecological niches is due to their high degree of adaptability to a wide range of environmental factors present findings correlation matrix of dissolved oxygen's were negatively correlated the low number of species abundant. The physicochemical changes happen by the heavy rainfall due to southeast monsoon bring considerable changes in the intertidal environment and near shore waters. The faunal compositions are showed strong relationship between the physico- chemical parameters and the distribution of organisms (Sekar *et al*., 2012). Present results of water salinity and other parameters constantly marked with chronological pattern, this indicates the ability of the organisms to survive under favorable and unfavorable environmental conditions as previously reported (Tyokumbur *et al.,* 2002). Results showed maximum numbers of polychaetes occur in the station 3, is an occupy dense growth of mangroves and oyster populations, previously mentioned this station had rich faunal assemblage and organic matter enriched marine environments, the particular place the capitellid polychaetes typically become dominant (Beukema, 1991). Another polychaete group with a worldwide distribution is the Nereididae. Nereids are commonly found in mud flats and are known to play an important role in sediment diagenesis and enhancement of physicochemical processes (Hylleberg and Henriksen, 1980).

Conclusion

In this paper we are accomplished a proportional to the intertidal polychaete and the current status of ecological health of the intertidal area of around vellar estuary in relation to anthropogenic pressure concerning the pollution effects with discharges of domestic and aquaculture waste in the Vellar estuary, the results of the present study to determined the population dynamics of few polychaete genera and conclude existing threats of the animal population with pollutions impact in estuarine ecosystem that affect the environment health. In future to conserve the marine environment without effluence to remedy from the cheapest source and techniques to sanitize the environment.

Acknowledgement

We would like to thank the Dean, Faculty of Marine sciences for providing the necessary facilities and to the Ministry of the Environment and Forest, New Delhi for financial support.

REFERENCES

Ajmal Khan S, and Murugesan P. 2005. Polychaete diversity in Indian estuaries. *Indian J. Mar.Sci*..34: 114-119.

Aller, 1982. Carbonate dissolution in near shore terrigenous muds: The role of physical and biological reworking. *J. Geol*. 90: 79-95.

Aruljothiselvi, A. 1998. Ecology and distribution of intertidal macrobenthos of Vellar estuary with specie reference to polychaetes. *M.Phil.,Thesis*, Annamalai University, India.

Balasubramaniyan, K. 1964. Studies on the ecology of the Vellar estuary. The intertidal and estuarine polychaete. *Jour. of Anna. Uni.* 25:101-103. Balasubramanyan, 1960 1964;

Beukema, J.J. 1991. Changes in the composition of bottom fauna of a tidal-flat area during a period of eutrophication. *Mar. Bio.*, 111:293–301.

Brinkhurst, R.O. 1987. Distribution and abundance of macroscopic benthic infauna from the continental shelf off southwestern Vancouver Island, British Columbia, Canada. Can. Tech. Rep. *Hydrogr. Ocean Sci*. No. 85 :86p.

Day, J.H. 1967. A monograph on the polychaeta of southern Africa. Parts 1 and 2, *British Museum (Nat. Hist.),* London. 878 pp.

Fauvel, P. 1953. The fauna of India including Pakistan, Ceylon, Burma and Malaya. *Annelida: Polychaeta*, Allahabad, 507 pp.

Geard, A. Amiard Triquet, C. Amiard, J.C. 2005. Do seasonal changes affect metallothionein induction by metals in mussels, *Mytilus edulis- Eco.Env. Safety*, 61: 209–220.

Gray, J.S. and Elliott, M. 2009. Ecology of Marine Sediments. From Science to Management, second ed. *Oxf.Univ. Press, Oxford*. 225pp.

Holland, A.F, Mountford, N. K, Mihursky, J.A.1977. Temporal variation in upper bay mesohaline benthic

communities: I. The 9-m mud habitat. *Chesa.Sci.* 18: 370-378.

Hutchings, P.1998. Biodiversity and functioning of polychaetes in benthic sediments. *Biodi. Cons.*, **7**, 1133–1145.

Hylleberg, J. and Henriksen K (1980) The central role of bioturbation min sediment mineralization and element re-cycling. *Ophelia.,* 1:l-16

Knox, G. A. 1977. The role of polychaetes in benthic soft-bottom communities. In: Essays on polychaetous annelids in memory of Dr. Olga Hartman, Reish D. J. & Fauchald K. (eds). pp. 547-604. Allan Hancock Foundation, Los Angeles.

Kundu, S. Nityananda Mondal, P.S. Lyla, S. Ajmal Khan. 2010. Biodiversity and seasonal variation of macro-benthic infaunal community in the inshore waters of Parangipettai Coast. *Environ.Monit Assess*., (2010) 163:67–79

Muss, B.J. 1967. The fauna of Danish estuaries and lagoons. *Medd. Dan. Fisk. Havunders*., N. S. 5:1-316.

Rodil, I.F. and M.Lastra.2004.Environmental factors affecting benthic macrofauna along a gradient of intermediate sandy beaches in northern Spain. *Est.Coast.Shelf. Sci.,* 61 :37.44.

Sebastin Raja, S.1990. Studies on the ecology of benthos in Sunnambar estuary. Pondicherry, Southeast coast of India. *Ph.D. Thesis, Annamalai University. India.*

Sekar, V. Rajasekaran, R. Oliva.J.F. 2012. Abundance of the onuphids polychaete *Onuphis eremita* in Tranquebar, Southeast coast of India. *Adva. Env.Sci.,*4(1):22-28.

Srikrishnadas, B. K. Ramamoorthi, K.Salasubramanyan.1987. Polychaetes of Porta Novo waters. J. *Mar. Bioi.* Assoc. *India* (1-2): 134-- 139.

Srikrishnadhas and Ramamorthi, 1982. Ecology of polychaete larvae of Portonova waters. *Indian J. Mar.Sci.,* 11(4):296-302.

Tataranni, M., Lardicci, C., 2010. Performance of some biotic indices in the real variable world: a case study at different spatial scales in North-Western Mediterranean Sea. *Environ. Pollut*., 158, 26–3

Tyokumbur, E.T, E.T. Okorie and O.A. Ugwumba, 2002. Limnological assessment of the effects of effluents on macroinvertebrate fauna in Awba stream and Reservoir, Ibadan, Nigeria. *The Zoologist*, 1(2): 59-62.

Van Hoey G, S. Degraer M. Vincx. 2004. Macrobenthic community structure of softbottom sediments at the Belgian Continental Shelf. *Est.Coast.Shelf. Sci.*.59.

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