Analysis of heavy metal in water of Dandi creek-west coast of India

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Abstract- The presence of heavy metals in sea water causes hazardous impact on the marine organisms. There are number of toxic metals like Cd, Cr, Pb, As, Cu, Hg and Zn increasing levels in the sea water are of serious problem today. They are released in large concentration through effluent discharges from industries, metal processing, paints and pigment production, biocides production, and through domestic sewage from nearby villages. The present study deals with the heavy metals distribution (Pb, As, Cr, Cd and Hg) in water of Dandi creek west coast of India. Three stations were selected for collection of water samples in different locations, station 1 (190 47' 24.7448''N and 720 40' 0.3'' E), station 2 (190 47' 31.141'' N and 720 41' 17.5474" E) and station 3 (190 47' 52.6553'' N and 720 41' 19.0925" E). Five metals including Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg) and Arsenic (As) were analyzed in the water of Dandi creek using Plasma Emission Spectrophotometer at Center of Excellence, Vapi, Gujarat (India). Out of these five metals Lead (Pb) was not detected in water sample through out the study period and Mercury (Hg) was detected in very low concentration mostly in station 3. Arsenic (As), Cadmium (Cd) and Chromium (Cr) were detected through out the study period at all 3 stations. The concentration of heavy metals shows variation in three different locations.

Index Terms- Dandi creek, water quality, heavy metals, west coast

I. INTRODUCTION

The presence of heavy metals in sea water causes hazardous impact on the marine flora and fauna. There are number of toxic metals like Cd, Cr, Pb, As, Cu, Hg and Zn increasing levels in the sea water are of serious problem today. They are released in large concentration through effluent discharges from industries, metal processing, paints and pigment production, biocides production, and through domestic sewage from nearby villages. Hence, the present study deals with the heavy metals distribution (Pb, As, Cr, Cd and Hg) in water of Dandi creek. Dandi is a part of Thane district of Maharashtra state. It is about 105 km away from Mumbai city and is situated between 19^0, 48.041' North longitude and 72^0, 41.255' East latitude. Dandi is famous fish landing centre in Thane district contributing 5 to 10 tones of marine fishes captured by local fishermen per year from this area (Fish Production Report 2006-07 and 2008-09 Maharashtra State), but due to growing chemical industries in Tarapur MIDC area the fish production was reported to be declining, discharges of effluents from various industries and domestic sewage from nearby villages causes hazards impact on

marine ecosystem of Dandi creek. Metal concentration in aquatic organism may be significantly influenced by temporal variations in metal levels within the ecosystem[1] .The discharge of heated effluents in the coastal water by thermal plant and industries not only cal produces adverse effect on coastal water but also can affects the planktonic community and bottom fauna[2]. The wastes of anthropogenic and industrial origin are of complex characters and have considerable percentage of heavy metals. The heavy metals in the brackish water phase generally deposit on the sediment bed or remain in dissolved state in the water column, depending on nature of chemical species which are influenced by factors like aquatic salinity, pH etc.[3]. Assessment of heavy metal concentration in the coastal water can be made by using indicator organisms such as marine algae[4,5]. The study of toxic and trace metals in the environment is more important in comparison to other pollutants due to their non-degradable nature, accumulation properties and long biological half lives[6].The present study has been carried out so as to understand water quality and concentration of heavy metals in an ecologically important marine ecosystem like Dandi creek.

II. MATERIALS AND METHODS

Water samples collected between September 2009 to September 2010 from Dandi creek-west coast of India (19^0, 48.041' and 72^0, 41.255'). Three stations were selected for collection of water samples in different locations, station 1 (19^0 47' 24.7448''N and 72^0 40' 0.3'' E), station 2 (19^0 47' 31.141'' N and 72^0 41' 17.5474" E) and station 3 (19^0 47' 52.6553'' N and 72^0 41' 19.0925" E).These stations covered an area of 12 km long and the depth varied from 2.7 to 25.5 meters (average 13.22 m). The study period lasted for 13 months (Sept 2009 to Sept 2010). The collected samples were stored immediately in an ice box and were brought to the laboratory for heavy metal analysis. Samples were prepared for five metals including cadmium, chromium, lead, mercury, and arsenic. The samples were analyzed in triplicates and the observations were recorded. The mean and standard deviation was calculated. Statistical procedure was followed as per G.-P. Zauke and I. Schmalenbach method[7].The metals were determined by plasma emission spectrophotometer at Centre of Excellence, Vapi (Gujarat) India.

III. RESULTS AND DISCUSSIONS

Five metals including Cadmium (Cd), Chromium (Cr), Lead (Pb), Mercury (Hg) and Arsenic (As) were analyzed in the laboratory, out of these five metals Lead (Pb) was not detected in

water sample through out the study period and Mercury (Hg) was detected in very low concentration mostly in station 3. Arsenic (As), Cadmium (Cd) and Chromium (Cr) were detected through out the study period at all 3 stations. The concentration of heavy metals shows variation in three different locations.

Identify the constructs of a Journal – Essentially a journal consists of five major sections. The number of pages may vary depending upon the topic of research work but generally comprises up to 5 to 7 pages. These are:

Table 1: Monthly variations in concentration of heavy metals in water of Dandi creek.

Months/Stations		Mercury (Hg)	Arsenic (As)	Lead (Pb)	Cadmium (Cd)	Chromium (Cr)
Sep 09	1	ND	0.0047	ND	0.005	0.0029
	2	ND	0.103	ND	0.007	0.0007
	3	< 0.008	0.0078	ND	0.0654	0.0069
Oct 09	1	ND	0.0078	ND	0.002	0.0052
	2	ND	ND	ND	0.0045	0.0072
	3	< 0.002	0.0026	ND	0.0264	0.0475
Nov 09	1	ND	0.0054	ND	ND	0.0087
	2	ND	0.0024	ND	0.009	0.0047
	3	< 0.005	0.0060	ND	0.005	0.008
Dec 09	1	ND	0.0082	ND	ND	0.004
	2	<0.002	0.0025	ND	ND	0.0024
	3	ND	0.0089	ND	0.062	0.0078
Jan 10	1	ND	0.004	ND	0.007	0.005
	2	< 0.004	0.007	ND	0.003	0.008
	3	ND	0.0102	ND	ND	0.0003
Feb 10	1	ND	0.0072	ND	0.0064	0.006
	2	ND	0.0024	ND	ND	0.002
	3	< 0.001	0.0092	ND	ND	0.0004
Mar 10	1	ND	0.0024	ND	0.0012	0.0014
	2	ND	0.0082	ND	ND	0.0033
	3	< 0.004	0.0089	ND	0.0076	0.0076
Apr 10	1	< 0.001	0.0045	ND	0.004	0.0011
	2	ND	0.006	ND	ND	0.0026
	3	ND	0.0065	ND	0.0049	0.0098
May 10	1	ND	0.0051	ND	ND	0.0042
	2	ND	0.0079	ND	0.007	0.0069
	3	< 0.004	0.0057	ND	0.0097	0.00488
June 10	1	ND	0.0032	ND	ND	0.0003
	2	ND	0.0029	ND	0.0079	0.008
	3	< 0.001	0.0086	ND	0.0074	0.0076
July 10	1	ND	0.0071	ND	ND	0.0074
	2	ND	0.0014	ND	0.002	0.0042
	3	ND	0.0069	ND	0.0026	0.092
Aug 10	1	ND	0.0096	ND	0.0067	0.0038
	2	ND	0.0011	ND	0.004	0.0012
	3	ND	0.0069	ND	ND	0.0032
Sep 10	1	ND	0.0072	ND	0.0021	0.0024
	2	ND	0.0035	ND	ND	0.0014
	3	< 0.00052	0.009	ND	0.0086	0.0089

Fig 1: Showing high concentration of heavy metal for each month.
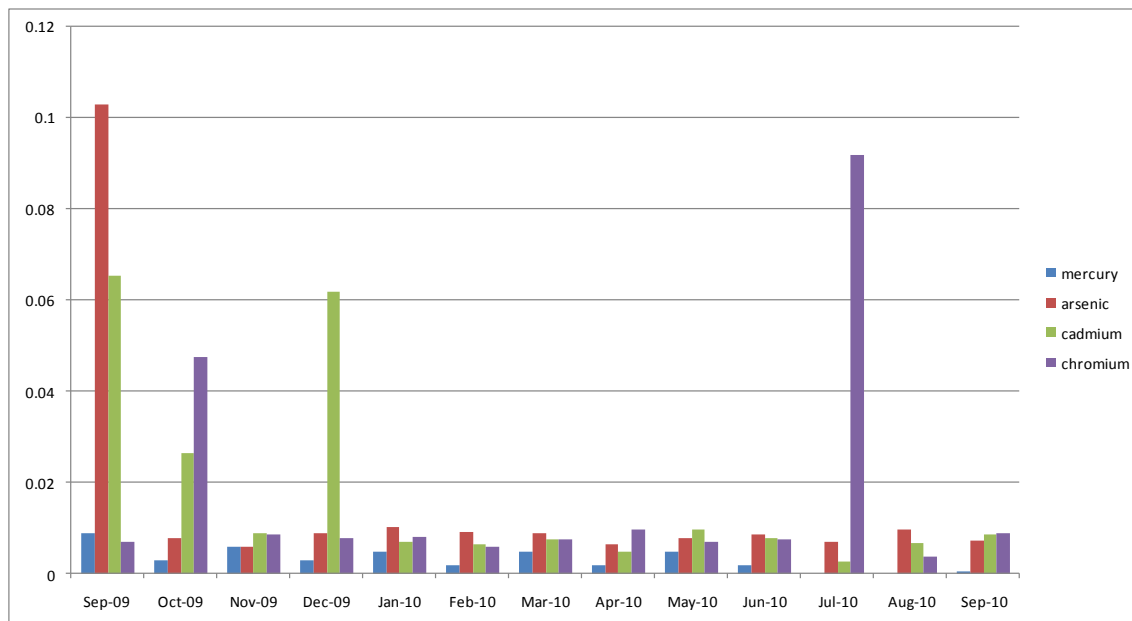
Marine ecosystems are highly complex, dynamic and subjected to many internal and external relationship that are subject to change over time. The pollutants that enter the inshore water and estuaries create serious problems causing extensive damage to the life and activities of the living aquatic organisms8.Trace element accumulation in aquatic consumers is of interest to ecologist and environmentalists so as to understand the fate and effects of contaminants in the food web dynamics as well as in the biogeochemical cycle of trace elements 9.The result indicated wide variations in the levels of heavy metals in water of Dandi creek.

IV.   CONCLUSION

The present investigation suggests that the health of Dandi creek is affected due to various developmental changes including the effluents from chemical and pharmaceutical industries of Tarapur MIDC area and domestic sewage from nearby villages. Presence of certain metals like Cd, Cr, As and Hg in water of Dandi creek is not good indicator for fish production, if control measure are not followed then the fishery potential of Dandi coastal area may decline and or may cause various diseases in human beings who consume fishes which the main food of people living in this coastal area.

V.   ACKNOWLEDGEMENT

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