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A field assessment on Karnafully estuarine ecology

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Abstract
The karnafully is the most important river of Chittagong division.it is originated from the lusai hill of Assam in India at latitude 22◦53'N and longitude 92◦27'E and has entered into Chittagong from north-eastern side to the west and southwest direction and finally falls into the bay of Bengal (latitude 22◦12'N and longitude 92◦47'E) at Patenga. Karnafully River is full of biodiversity and enriched estuarine ecosystem. But it is degrading day by day in this report, karnafully phytoplankton (13 species), zooplankton (10 species), benthos (11 species) and sediment from two sites have been studied plankton are higher during low tide than high tide. And from sediment texture sand are greater quantities. The study also involved determination physical-chemical parameters of karnafully river estuary from different points (10 Ghat and 18 Ghat stations).

Keywords: karnafully, phytoplankton, zooplankton, benthos, biodiversity, estuarine ecosystem

Introduction
Karnafully river is a major river in southeaster part of Bangladesh which carries huge amount of discharge, falls into Bay of Bengal (latitude 22◦12'N and longitude 92◦47'E) at Patenga. In estuary, phytoplankton are important components and basis of food web. They regulate estuarine productivity. Due to the industrial, unplanned and untreated municipal pollution, heavy metals, invasive invasions, its estuarine biodiversity and ecosystem is degrading day by day. So zooplankton, nekton, benthic community are decreasing. The diversity of natural populations is partially dependent on the environmental variables which always affect the competing populations. Estuaries are areas of physical and biological transition between the land, freshwaters, and the sea. This straddling of boundaries between land and sea, coupled with continual tidal mixing of fresh and salt waters, make estuaries dynamic, complex and highly productive ecosystems (Mann 1982)". "Estuaries fulfil key roles in the life histories of a wide range of fisheries species, including sites for spawning, feeding, nursing, and migration. Throughout the world, estuaries are among the most modified and threatened environments (Blaber *et al*. 2000) [1].

Theory
Interpretation of data: the total numbers of major taxa of zooplankton were determined and their concentrations were computer as indivis /m^3 of water and their respective percentage.
Phytoplankton sample collected by using Phytoplankton net. Then collected sample kept in one litter plastic bottles for preservation. Sample was ready for laboratory analysis later. In each catch the total number of individual count either by complete counting or by sub-sampling. The zooplankton concentration was calculated at ind. m^{-3} where, total volume of water (m^3) filtered through the net was calculated by using the following equation:
Total volume of water (m^3) = {(FR-IR) × co efficient} × $2\pi r^2$.
Where, FR=final reading; IR=Initial reading; Coefficient=0.3; r=Radius of ring of used at plankton net=12 cm; π=3.1416
Zooplankton assemblage data were analysed with the Plymouth Routines in Multivariate Ecological Research (PRIMER) statistical package version 6. Diversity of the species assemblage was analysis by the Shannon-Wiener Index (H') (Shannon and Weaver, 1949) [2]. Species richness were measured by Margalef Index (d) (Margalef, 1968) [3] and evenness was measured by Pielou's Index (J') (Pielou, 1966) [4]. The BIO-ENV program (Clarke and Warwick, 1994) in the PRIMER (v.6) package was used to evaluate and compare the relative importance of different hydrological factor measured and their influence on the identified

zooplankton communities. The multivariate Spearman rank correlation between 8 hydrological and the abundance data of Zooplankton community assemblages consist of 12 major groups of the habitat was explored by the BEST (BIO-ENV) procedure of PRIMER software (v.6). This allowed easy identification of the factors that had the greatest effect on community structure. The data was subjected to multivariate statistical analyses to study the influence of different hydrological factors on the abundance of the Zooplankton community using multiple linear regression analysis Sokal & Rholf (1981). The contribution of hydrological factors to explaining the dependent variable (abundance of each zooplankton group) was compared using Beta values at the 95% & 99% confidence level using the SPSS v.11.5.

Soil texture was determined by the method described by Bouyoucos, 1962 Reagents.

1. 1 N NAOH solution.
2. Distilled water.

Producer

1. 1.25g of oven dry soil (150 degree Celsius) was taken in a breaker.
2. 50ml distilled water was added.
3. The contents were stirred thoroughly with a glass for half an hour.
4. Then 10ml 1N NaOH solution was added, stirred thoroughly.
5. The contents were transferred to a 1000ml sedimentation cylinder.
6. The volume of contents was making up to 1000ml by adding distilled water.
7. The suspension was allowed settle and reading was taken by a soil hydrometer and thermometer exactly after 1min and after 2 hrs.

Study area

Karnafully, the most important river of Chittagong, originates from the south Lushai Hills of Assam, India at latitude 23°50' N and longitude 92°27' E and after following a south-westerly course through the Hill Tracts it enters the district of Chittagong through the east of Chandraghona. It runs over the district in a zigzag path and after a course of about 170 km falls into the Bay of Bengal at latitude 22°12' N and longitude 91°47' E, about 16 km southwest of Chittagong town. Water and sediment samples were collected from the Area -1 22◦16'3.43"N, 91◦49'23.32"E – 10 Ghat), (Area -2 22◦14'8.61"N, 91◦ 48' 47.37"E – 18 Ghat)

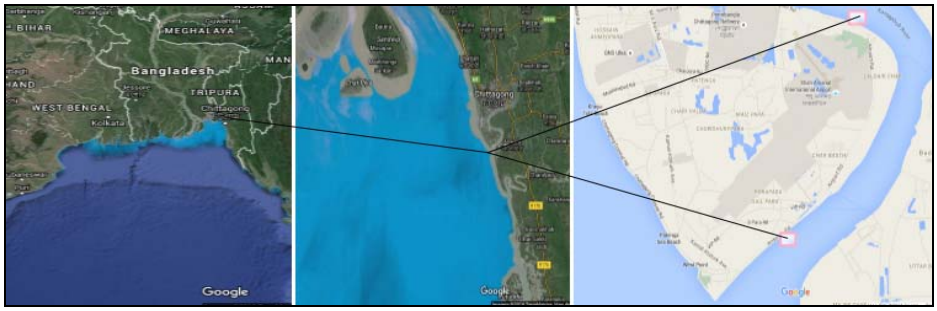


Fig 1: Study area karnafully River, chittagong, Bangladesh

Materials and Methods

Zooplankton samples were collected from surface waters at (10 no. ghat and 18 ghat. Zooplankton sampling have been carried out with the help of conical zooplankton net made of Nylon Silk of 335 micro meter mesh size and having 24 cm circular mouth opening fitted with a plastic bucket at the coded. A digital flow meter was set up at the mouth of the net to record the amount of water filtered through the net during sampling. Samples were collected at sampling stations from the surface water. After collecting samples were preserved in 5% formalin (5% for phytoplankton, 10% for benthos). For efficient sorting, the samples were stained with Rose bangle and left for overnight. All the zooplankton attained pink colour (eosin) rendering easy identification. The stained plankton was stored out from debris with fine brush, needle, forceps and low power microscope. The sorted organisms were preserved in 70% ethanol and brought under the microscope and identified according to Zafar (1986).

Results

Sediment sample collection and processing:

Grab sampler used to collecting sediment sample from the High tide mark station at High tide period of various sampling time. The diameter of core sampler is 10 cm and the length 20 cm. keep the collected sediment sample into a polythene container (500g to 1 kg). After reaching at laboratory collected sediment sample are spread on the sheet of paper or trays and dried in air (exposure to sun light hasten the drying). Break the larger aggregates preferably in a wooden mortar and pestle and pass the sediment sample through a 0.30mm sieve. The sieved sediment sample in then weighted and the mouth of the plastic container are well capped (labeling on each container are necessary). Store the container in a cold place in the laboratory. Immediate analysis is ideal. Storage is low temperature (4 degree Celsius) is perhaps the best way to preserve most samples until the next day.

Sediment sample Preservation

Sediment sample preserve in low temperature (less than 25 degree Celsius) room in the plastic pack for further analysis.

Faunal Composition

1.a. Total number of zooplankton specimens/ individuals of all groups

$$\frac{V_1=1.683\ m^3}{V_2=28.5278 m^3}$$

Where

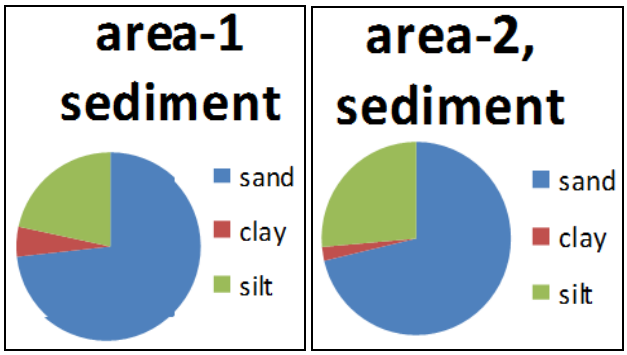
A = Mouth area of the net= $(3.14) \times (.12)^2 = .04522\ m^2$

R = Flow meter reading and = $R_1 = 62$, $R_2 = 1051$

V = Volume of water filtered.

Table 1: Faunal composition.

	Name of the species	Sample -1	Sample-2	Ind/m^3 sample^{-1}	Ind/m^3 Sample-2	Phytoplankton	
						Station:-1	Stations:-2
1	Copepod	808	3208	480	112.45	Coscinodiscus sp.	Coscinodiscus sp.
2	Sagitta	8	45	4.753	1.577	Chaetoceros sp.	Pleurosigma sp.
3	Isopod	4	9	2.376	0.315	Nitzschia sp.	Chaetoceros sp.
4	Crab larvae	6	17	3.565	0.5959	Pseudonitzschia sp.	Skeletonema sp.
5	Acari	1	2	0.594	0.070	Pleorosigma sp.	Thalassionema sp.
6	Shrimp larvae	10	22	5.942	0.771	Rhizosolenia sp	Rhizosolenia sp.
7	Hydroida	15	10	8.913	0.3505	Thallasionema sp.	Pseudonitzschia sp.
8	Fish larvae	1	4	0.594	0.140	Tabellaria sp.	Pseudonitzschia sp.
9	Oligochaeta	2	1	1.1883	0.035	Amphiprora sp.	Guinardia sp.
10	Cladocera	64	88	38.03	3.085	Melosira sp.	Ceratium sp.
Total		921	3401	545.955	119.3894	Coscinodiscus sp.	Coscinodiscus sp.



(a) (b)

Fig 2: quantities of Sampling: a) station 1 sediment texture; b) station 2 sediment texture

Discussion

The study has recorded 10 species of zooplankton (copepod, sagitta, isopod, crab larvae, acari, shrimp larvae, hydroida, fish larvae, oligochaeta, Cladocera), 14 species of phytoplankton (*Coscinodiscus sp. Pleurosigma sp. Chaetoceros sp. skeletonema sp. Thalassionema sp. Rhizosolenia sp. Pseudonitzschia sp. guinardia sp. Ceratium sp. Odontella sp. Asterionella sp.)9 species of* Benthos (ragworm, pectinaria, common whelk, periwinkle, Neptune welk, scallop, skeleton shrimp, crab larvae, benthic amphipod). but masum (2010), identified 16 zooplankton (copepod, Cladocera, sagitta, amphipod, isopod, mysidacea, crab larvae, penaeidae, caridean, acetes, oligochaeta, fish larvae, gastropoda, acari, polychaeta, hydroida from karnafully river estuary of which 4 genera of Cladocera were also identified. Goswami (1985) [10] identified 24 zooplankton texa namely copepod, Cladocera, pteropods, sergestids, other decapods larvae, chaetognaths, siphonophores, hydromedusae, polychaeta larvae, fish eggs, oikopleurans, amphipods etc. from the coastal water of GOA. Islam (2003) [11] identified 22 genera from the Karnafully River. The number of zooplankton varied between 15.26ind/m3 and 21.945ind/m3 during monsoon, 18.357 ind/m^3 and 224.395 ind/m3 during post monsoon and 17.443 ind/m^3 and 41.003 ind/m^3 during pre-monsoon. According to islam (2003) [11] next to copepod, Cladocera occupied the second dominant constituent during monsoon and pre-monsoon in karnafully river estuary, the present study agrees with him.

Conclusions

This paper has covered just two stations from estuarine river. After analysing, Karnafully estuarine ecology is enriched with numerous phytoplankton, zooplankton and benthos. But industrial pollution caused a huge damage in biodiversity. Water quality of this river is moderately polluted but if this continues, the river will be dead zone for local species.

Conflict of Interest

I would like to submit the manuscript entitle "A field assessment on karnafully estuarine ecology". I personally took samples and analysed. There is no update about this topic. I have tried to find the recent story and record from national and international paper by reviewing. I declare that this manuscript is original, has not publish before and is not currently being considered for publication elsewhere.

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