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Occurrence and Abundance of Macrobenthos of Hatiya and Nijhum Dweep Islands, Bangladesh

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Abstract: The present study was undertaken to know the distribution of intertidal macrobenthos of Hatiya and Nijhum Dweep during premonsoon (January-June, 2010). The macrobenthos of Hatiya and Nijhum Dweep were collected by using hand-held mud corer (10 cm x 10 cm x 10 cm) having a mouth opening of 0.01 m^2 from seven different stations. A total of 10 major groups/taxa were identified during premonsoon from all stations. The maximum density (4511 individual /m^2) was found at Nijhum Dweep Namar Bazar and the minimum (433 individual /m^2) at Nalchira Ghat. The macrobenthos included polychaetes (45.03 %), oligochaetes (16.65 %), shrimp larvae (13.93 %), crab (9.63 %), gastropods (3.56 %), isopods (1.15 %), bivalves (1.15 %), copepods (0.73 %), annelids (0.42 %), amphipods (0.63 %) and others (7.12 %). Polychaetea, oligochaetea, shrimp larvae and crab contributed 85.24 % of total population. Polychaete was dominant by contributing 45.03 % of total macrobenthos. The information which is included here can be used to measure the impact of pollution, to conserve biodiversity of those area and anyone can use for further study.

Key words: Macrobenthos · Intertidal Zone · Abundance · Hatiya and Nijhum Dweep

INTRODUCTION

Macrobenthos are an important and integral component of all aquatic ecosystems which lives on, in or near the bottom of water bodies [1] Benthic organisms serve as direct food for other higher trophic organisms (fin and shell fishes) and act as ecological engineer recycling the organic matter and other debris [2]. They have been used for long time as indicator of water and sediment quality by major biomonitoring programs [2]. Some benthic organisms (shrimp, crab, oyster, clam etc.) are important source of protein for human and some are used as ingredients for fish and poultry feed production [3]. Lime and pearl are two important products of Macrobenthos [4]. Longhust [5] first investigated the relationship between demersal fish and soft bottom benthos in a West African estuary and found that macroinvertebrates were the main diet for fish. These organisms link the producers and with higher tropic levels.

Hatiya and Nijhum Dweep are the two islands under the Noakhali district located in the northern part of Bay of Bengal and southern part of Bangladesh. They occupy a large area of mangrove mudflats, tidal creeks, reed beds with high biodiversity [6]. These two islands are frequently subjected to tropical cycles, erosion and strong wave action.

Although globally macrobenthos have been much studied but in Bangladesh the published information on macrobenthos of coastal area is scanty. Sharif [7] and Hossain [1,3] gave an idea on the Macrobenthos of Meghna River estuary which deals with the benthos distribution of the Hatiya Island that included only one point of this Island and their study did not cover Nijhum Dweep as well. So the aim of this study is to document the abundance and composition of macrobenthos around Hatiya and Nijhum Dweep Islands.

MATERIALS AND METHODS

Sampling Locations: The samples were collected from seven stations of Hatiya Island and two stations of Nijhum Dweep (Fig. 1).

Nalchira Ghat: Nalchira Ghat is situated in the northern part of Hatiya and southern part of Noakhali. It is

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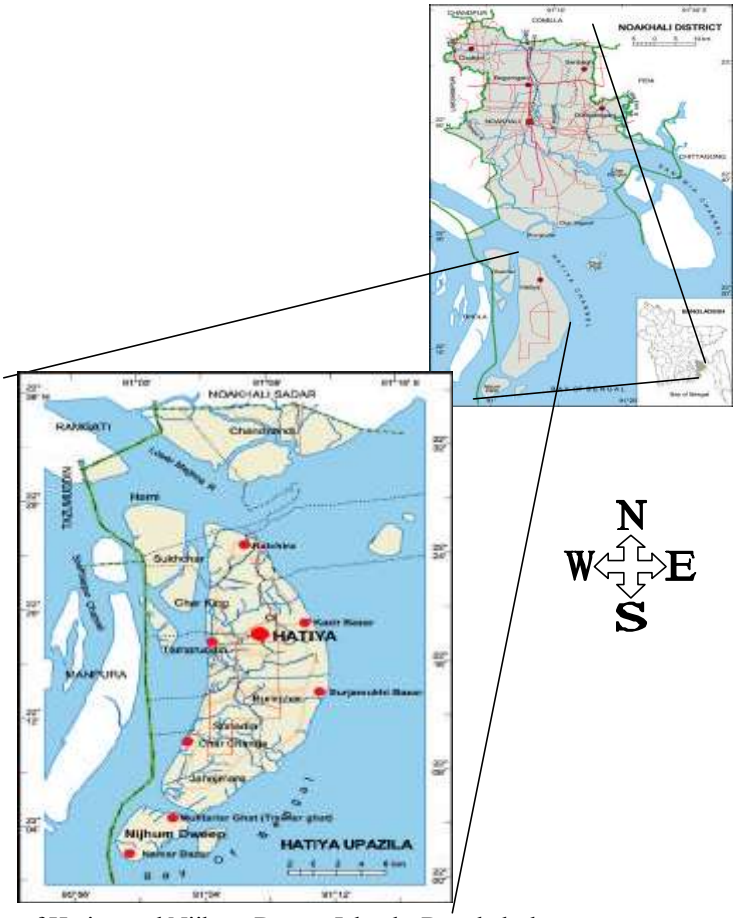

Fig. 1: Sampling locations of Hatiya and Nijhum Dweep Islands, Bangladesh.

subjected to high erosion. Salinity varied from 3-12 ppt. In this sandy area tidal influence is strong. Temperature varied from 25-32°C at this area.

Kazir Bazar: The station is located at the east of the Ojkhali Bazar (Hatiya Upazila). Tidal influence is active. Samples were collected from clay bottom area. It is subjected to erosion. Average temperature and salinity are 28°C and 4-12 ppt.

Surjamukhi Bazar: It is situated in the south-eastern area from Ojkhali Bazar. Tidal influence is active. Samples were collected from clay bottom area. It is not subjected to erosion. Average temperature and salinity are 25-27°C and 4-12 ppt.

Charchenga Ghat: The station is situated in the south-western part of Ojkhali Bazar. Tidal influence is strong. Samples were collected from sandy bottom area. It is subjected to high erosion. Temperature varied from 25-31°C and salinity 8-15 ppt.

Tamaruddin Ghat: It is located at the west of the Ojkhali Bazar (Hatiya Upazila). Tidal influence is very strong here. Samples were collected from sandy bottom erosion area. Temperature varied from 22-29°C and salinity ranged from 3-15 ppt.

Nijhum Dweep Trawler Ghat: It is located at southern part of Hatiya and northern part of Nijhum Dweep. Tidal influence is active here. Salinity varied from 10-20 ppt and temperature 25-30°C. Samples were collected from clay bottom area. It is subjected to high erosion.

Nijhum Dweep Namar Bazar: It is located at southern most part of Hatiya. Salinity varied from 15-25 ppt and temperature 25-33°C. Tidal influence is active and water body is turbid. It is used as fishing zone.

Sample Collection and Analysis: The seven working stations were selected in different parts of Hatiya and Nijhum Dweep. Each station was divided into three sub-stations (sub-station=01, sub-station=02 and

sub-station=03). Three replicate samples were collected from each station with hand-held mud corer (10 cm x 10 cm x 10 cm) having a mouth opening of 0.01 m^2 during pre-monsoon (January-June, 2010). The sampler was pushed into the sediment and sediment of the corer was taken in polyethylene bags and marked over the bags by a marker pen. Replicate samples were taken from intertidal area of the stations. The sediment samples were transferred from polyethylene bag to bucket and mix with water. Then the mixed water passed through a hand-sieve with 0.5 mm mesh. The sieved organism were preserved with other residues in the plastic container with 10% buffered formalin and labeled and then transferred to laboratory for further analysis. In the laboratory, small amount of "Rose Bengal" was added to increase visibility of organisms. For identification, the samples were taken into a round transparent Petri dish (diameter 15 cm and depth 2 cm) and placed on a white paper background for the easy contrast of vision. Organisms were sorted and enumerated under major taxa and preserved in small vials by using small brush or forceps. Binocular microscope with digital camera, model No: XSZ21-05DN) was used to identify and capture the image of benthos. An attempt has been made to identify the macrobenthos up to genus or species level but due to time limitation, lack of fund and appropriate literature it was not possible.

RESULTS AND DISCUSION

Quantitative distribution of intertidal Macrobenthic of Hatiya and Nijhum Dweep has been furnished in Table (1, 2) and Figures (2, 3). The fauna comprised 10 taxa.

Polychaetes: Presence of polychaetes were the highest (682.54 ind./m^2) among macrobenthos. They were limited at Nalchira *ghat* due to pressure of human activities. Maximum value (2588.89 ind./m^2) was found at Nijhum Dweep Namar Bazar and minimum (44.44 ind./m^2) at Nalchira Ghat. They were common at all stations.

Oligochaetes: Olygochaetes were common at all stations and occupied second position as regards abundance of total Macrobenthos. The maximum value (888.89 ind./m^2) was recorded at Nijhum Dweep Namar Bazar and the minimum (22.22 ind./m^2) value was recorded at Tamaruddin Ghat and Nijhum Dweep Trawler ghat.

Table 1: Group/taxa-wise total abundance of macrobenthos in all stations at Hatiya and Nijhum Dweep.

Species	Individual/m^2	Percentage (%)	Rank of abundance
Polychaetea	682.54	45.03	1
Oligochaeta	252.38	16.65	2
Shrimp larvae	211.11	13.93	3
Bivalvia	17.46	1.15	7
copepoda	11.11	0.73	8
Crab	146.03	9.63	4
Amphipoda	9.52	0.63	9
Isopoda	17.46	1.15	7
Gastropoda	53.97	3.56	6
Annelida	6.35	0.42	10
Others	107.94	7.12	5
Total	1515.87	100.00	

Table 2: Station wise total abundance of macrobenthos at Hatiya and Nijhum Dweep

Station Name	Individual/m^2	Percentage (%)	Rank of Individual
Nalchira Ghat	433.33	4.05	7
Kazir Bazar	1033.33	9.67	4
Surjamukhi Bazar	2100.00	19.65	2
Charchenga Ghat	1555.56	14.55	3
Tamaruddin ghat	566.67	5.30	5
Nijhum Dweep Namar Bazar	4511.11	42.20	1
Nijhum Dweep Trawler Ghat	488.89	4.57	6
Total	10688.89	100.00	

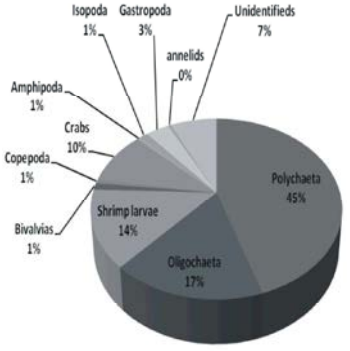

Fig. 2: Percentage composition of macrobenthos in the study area.

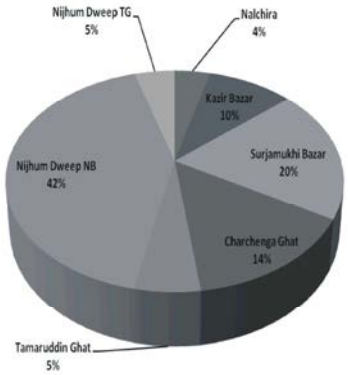

Fig. 3: Percentage composition of macrobenthos at each station.

Gastropods: They constituted 53.97 % of total Macrobenthos (Table 1). Gastropods had its highest density (288.89 ind./m^2) at Surjamukhi Bazar and lowest (22.22 ind./m^2) at Tamaruddin Ghat and Kazir Bazar

Amphipods: Amphipods contributed 0.63 % of total Macrobenthos (Table1). Maximum value (22.22 ind./m^2) was found at Surjamukhi Bazar and Nijhum Dweep Trawler Ghat and the minimum (11.11 ind./m^2) at Nijhum Dweep Namar Bazar and Tamaruddin Ghat.

Bivalvia: Bivalvia were found only two stations of the study area. Maximum value (111.11 ind./m^2) was found at Nijhum Dweep Namar Bazar and minimum (11.11 ind./m^2) at Kazir Bazar (Table 2). Bivalvia ranked 7th and contributed 1.15 % of total Macrobenthos (Table 1).

Copepods: They constituted 0.73 % of total Macrobenthos (Table 1) and the ranked 8th. Maximum value (33.33 ind./m^2) was found at Nijhum Dweep Namar Bazar and Nalcrira Ghat and minimum (11.11 ind./m^2) at Charchenga Ghat.

Shrimp Larvae: It constituted 13.93 % of total Macrobenthos (Table 1) and the ranked 3rd. Maximum value (655.56 ind./m^2) was found at Surjamukhi Bazar and minimum (11.11 ind./m^2) at Kazir Bazar.

Crab: Crab was common at all stations. They constituted 9.63 % of total Macrobenthos (Table 1) and the ranked 4th. Maximum value (522.22 ind./m^2) was found at Surjamukhi Bazar and minimum (11.11 ind./m^2) at Nijhum Dweep Namar Bazar.

Isopods: They constituted 1.15 % of total Macrobenthos (Table 1) and the ranked 7th. Maximum value (77.78 ind./m^2) was found at Nalchira Ghat and minimum (11.11 ind./m^2) at Surjamukhi Bazar.

Abundance and composition of macrobenthos are varied in the stations due to prevailing abiotic and biotic factors. Biotic factors that affects the living organisms in the intertidal zone such as competition for space and food, predation, reproduction substrate settlement preference, osmoregulation [8]. Abiotic factors that affect the living organisms in the intertidal area such as salinity, temperature, air and light exposure, tidal flow, waves and current action, substrate, wind direction and strength, dissolved O_2, storms, natural disasters [9].

Alam [10] identified 8 major taxa namely polychaetes, decapoda, bivalvia, gastropods, amphipods, bopoda, mysidacea, pisces and diptera from the intertidal zone of the Halishar coast, chittagong. In this study 10 groups/taxa were identified and including these groups adding some more groups (oligochaete, crab, copepods and isopods). At Hatiya and Nijhum Dweep a total of 10 groups were identified where polychaetes were the dominant species and constituted 45.03 %. Polychaetes were found in all stations of study area. The maximum abundance 682.54 ind./m^2 and minimum 6.35 ind./m^2 were found in the study area. Hossain [3] described 20 taxa of macrozoobenthos of the Meghna River estuary, consisting of oligochaetes (53.75 %), polychaetes (33.31 %) and mesogastropods (4.94 %). These three groups together contributed about 90 % of total population. Population density varied from 96 to 9410 ind./m^2. The maximum and minimum incidence was found during post-monsoon and monsoon at Chandpur and Hatiya respectively. In the present study during premonsoon 10 taxa (polychaetes (45.03 %), olygochaetes (16.65 %), shrimp larvae (13.93 %), bivalvia (1.15 %), copepods (0.73 %), crabs (9.63 %), amphipods (0.63 %), isopods (1.15 %), annelids (0.42 %) and gastropods (3.56 %) were recorded. Rao and Sharma [11] reported that nematodes, foraminiferans and ostracodes relatively higher number occurred in during the postmonsoon in Gosthain estuary. During monsoon and summer season relatively bivalves, oligochaetes and polychaetes were dominant. This study shows polychaetes (682.54 ind./m^2) and oligochaetes (252.38 ind./m^2) were dominant during pre-monsoon at Hatiya and Nijhum Island. This difference was mainly due to different seasons. Nandi and Chowdhury [12] identified different species of benthos such as polychaeta (5 species), gastropoda (5 species), decapoda (5 species), coelenterata (2 species), bivalvia (2 species), pisces (2 species) and nemertinea (1 species) from the mud flat of Sagar Island, sunderbans and West Bengal, India.

Every living organism plays an important role in the environment. For maintaining ecological balance of environment existence of micro, macro and meio-benthos is essential. Ecological imbalance and environmental problems are occurred when any group of organisms are extinct or lost. Hatiya and Nijhum Dweep are two important islands for Bangladesh for their high biological diversity. By realizing high plant and animal biodiversity in this area, Bangladesh government designated Nijhum

Dweep as national park in 2001 [6] but details study on biodiversity has not yet been conducted. So to get a comprehensive picture of benthic biodiversity a further study is recommended.

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