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MACROBENTHIC FAUNA OF AN AQUACULTURE POND OF CHAKARIA SUNDERBAN, BANGLADESH

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The macrobenthic fauna alongwith limnological factors of a traditional aquaculture pond were investigated for a year (June, 1982 to May, 1983) at Chakaria Sunderban. The higher density of macrobenthos during the dry season (Nov. - Apr.) coincided with a higher salinity regime (13.05-35.42%). The population peak of (24 923.32 specimens/m^2 and biomass, 163.33 g/m^2) occurred in Jan. Animals occurred in lower densities during the rainy season (May- Oct.) and the lowest was in June (1111.65 specimens/m^2), 917 g/m^2. The macrobenthos were identified under 10 taxonomic groups, their temporal and spatial distribution have been recorded. The macrobenthic community of the pond was dominated by Tanaidacea, Amphipoda and Polychaeta errantia, all of which occurred throughout the period of investigation.

Key words: Macrobenthos, Limnological factors, Aquaculture pond.

Introduction

At present bulk of the marine shrimp produce of Bangladesh is harvested from coastal brackish water ponds. Thus, ecological study of these ponds is important. Benthos are the organisms that inhabit the bottom substrates of ponds, lakes and streams etc. They play several important roles in the aquatic community, being involved in the mineralization and recycling of organic matter produced in the water column or brought in from external sources. They are important second and third links in the tropic sequence of aquatic communities [1] and are important source of food of many fishes and shrimps during both planktonic and adult stages [2-4].

Information of the macrobenthos of a aquaculture pond of Bangladesh is not available, but some investigations on the macrobenthos of some freshwater bodies are available [5-9].

Materials and Methods

Samples were collected at fortnightly intervals from three stations of a traditional aquaculture pond, having an area of 5 ha with an average depth of 1.5 m, at Chakaria Sunderban (Fig. 1) for one year between June, 1982 and May, 1983. The bottom samples were collected by a Van Veen grab (0.024m2), washed through a sieve (mesh no. 40, Hydrobios), and the residue along with the bottom fauna were preserved in 5% neutralized formalin in the field. For replication two samples were collected from one station. Concurrently, water temperature was recorded by a bucket thermometer. Samples were drawn for determination of salinity, pH and dissolved oxygen. pH was recorded by a digital corning pH meter. A Secchidisc (30 cm diameter) was used to record the transparency of water. Data on rainfall were obtained through the courtesy of the Meteorological Department, Cox's Bazar.

In the laboratory, benthic organisms were separated into major taxonomic groups following different authors [10-12]. Their numbers have been expressed as the number of individuals per meter square. Biomass (wet weight) was determined as gram per meter square.

Results and Discussion

Water temperature of the study are arranged from 19.68° to 32.9° (Table 1). The lowest temperature was recorded in Jan. and the highest in Sept. The concentration of dissolved oxygen varied from 3.2 ml/l to 8.04 ml/l. Its maximum value

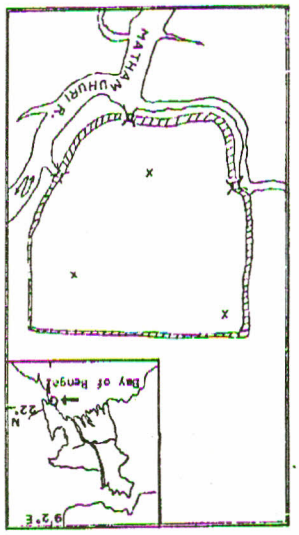

Fig. 1. Showing the locations (x) of stations occupied for sampling in a coastal aquaculture pond of the Chakaria Sunderband, geographical location of which has been pointed out in the map of Bangladesh (inset).

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TABLE 1. MONTHLY DISTRIBUTION OF MACROBENTIC FAUNA (SPECIMENS/M²) AND LIMNOLOGICAL PARAMETERS IN A TRADITIONAL BRACKISHWATER AQUACULTURE POND AT CHAKARIA SUNDERBAND, BANGLADESH.

Months 1982-83	Pletynel minthes	Polychaeta errantia (Family-Nereidae & Nephthydidae)	Polychaeta sedentaria (Family-Cirratulidae & Terebellidae)	Other annelids	Pria pulida	Cumacea (Family-diastylidae)	Amphipoda (Family-gammaridae Corophlidae)	Tanaidacea (Family-taneidae)	Impoda (Family-anthuridae)	Molluse (Family-viviperidae	Limnological Parameters					
											water temperature (°C)	dissolved oxygen (ml/l)	salinity (%)	secchi depth (cm)	pH	Rainfall (cm)
June	–	458.33	7.08	–	7.08	–	111.25	236.25	34.58	257.08	30.27	5.67	12.67	88.00	7.4	53.60
July	–	1798.33	34.58	2492.91	7.08	62.5	1069.58	2944.16	117.92	–	29.00	5.30	12.16	74.83	7.2	86.60
August	–	430.42	–	–	–	–	895.83	1882.08	69.56	7.08	27.90	5.50	3.49	130.83	7.3	78.50
September	–	41.66	–	–	–	–	1486.25	3257.08	48.75	–	32.16	5.98	1.91	51.66	7.2	48.30
October	–	62.50	–	–	–	–	1444.58	1992.92	69.58	–	31.30	5.73	2.00	98.50	7.2	0.30
November	–	361.25	–	–	–	–	1742.91	6770.83	62.50	62.50	27.16	6.18	13.05	54.50	7.5	11.90
December	–	611.25	–	–	–	–	1833.30	6076.25	–	770.83	21.46	6.09	19.32	60.50	7.5	–
January	13.75	3347.08	–	–	–	7.08	4750.00	16125.00	20.83	659.58	19.68	5.36	26.84	63.50	7.4	0.80
February	–	1791.67	–	–	–	–	3791.69	14173.33	–	319.59	23.28	5.67	35.42	45.17	7.4	4.70
March	–	6833.33	–	–	–	284.08	2992.97	7979.17	48.75	708.33	26.93	6.02	34.84	57.17	7.6	9.00
April	–	4687.50	125.00	–	–	152.92	3125.00	7242.92	41.66	1722.08	30.67	8.04	28.08	51.00	7.5	13.20
May	–	861.25	507.08	–	–	7.08	2694.58	4125.00	62.50	458.33	32.08	3.20	17.77	61.67	6.8	15.71

(8.04 ml/l) was recorded in April. Salinity ranged from 1.91 to 35.42% highest value being recorded in Feb. and the lowest in Sept. Secchidepth varied from 45.17 cm (Feb.) to 130.83 cm (Aug.). The pH varied through a narrow range of 6.8 to 7.6. The effective rainfall was confined to the monsoon months (June - Sept.) with the maximum (86.6 cm) in July.

Benthic macroinvertebrates occurred throughout the period of study, with the maximum density (24923.32 specimens/m²) and biomass (163.33 g/m²) in Jan., when higher salinity (26.84%) also prevailed. The lowest density (1111.65 specimens/m²) and biomass (9.17 g/m²) were recorded in June, when salinity gradually decreased following heavy rainfall (Fig. 2).

The macrobenthic fauna were identified under 10 taxonomic groups (Fig. 3). Tanaidacea (family-Tanaidae) was the most abundant group and occupied 56.32% of yearly total population. The other constituents were Isopods (Family-Anthuridae (0.45%), Cumacea (0.4%), Amphipoda (20.06%), *Polychaeta errantia* (16.46%). Mollusca (3.84%), other annelids (1.93%), Polychaeta sedentaria (0.52%) Platyhelminthes and Priapulida (0.01%).

Monthly distribution of different groups of macrobenthos along with limnological parameters have been shown in Table 1.

Platyhelminthes (flatworm). They were recorded once in Jan. (13.75 specimens/m²) when the salinity was high (26.8%).

Polychaeta errantia (family Nereidae, and Nephthydidae): *Nereis* sp. and *Nephthys* sp. occurred throughout the study period. The maximum density was recorded in March (6833.33 specimens/m²), when higher salinity (34.84%) prevailed and the minimum (41.66 specimens/m2) was in September when salinity was low (1.91%).

Polychaeta sedentaria (family-Cirratulidae and Terebellidae): *Cirratulus* sp. and representatives of family-Terebellidae were found during April through July The maximum

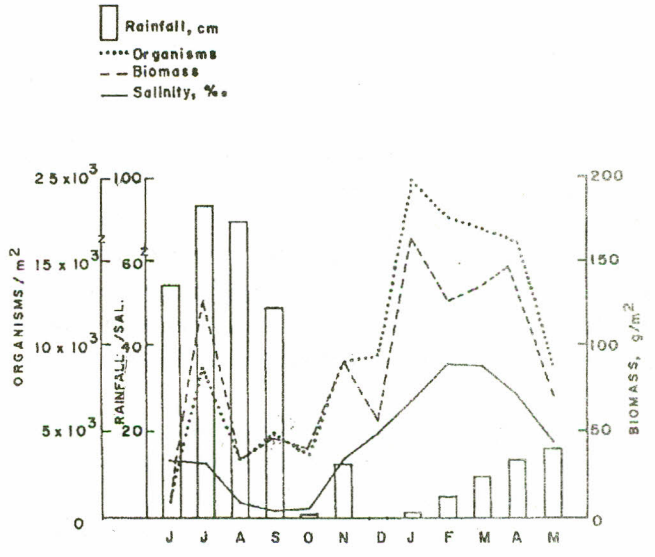

Fig. 2. Abundance of macrobenthic fauna and its relation with salinity and rainfall in a traditional brackishwater aquaculture pond of the Chakaria Sunderband.

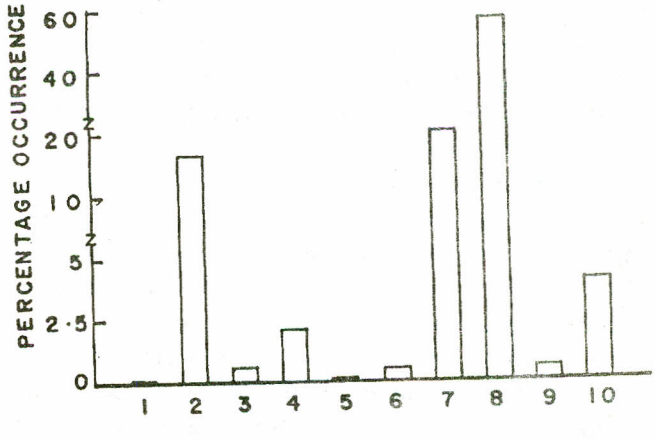

Fig. 3. Annual percentage occurrence of macrobenthic fauna (1. Platyhelminthes, 2. Polychaeta errantia, 3. Polychaeta sadentaria, 4. Other Annelids, 5. Priapulida, 6. Cumacea, 7. Amphipoda, 8. Tanaidacea (F. Tanaidae), 9. Isopoda (F. Anthuridae), 10. Mollusca of a brackishwater aquaculture pond in the Chakaria Sunderband.

density (507.08 specimens/m²) was recorded in May, when the salinity was 17.77% and the minimum (7.08 specimens/m²) in June.

Other annelids. Individuals of this group were recorded once only-during July (2492.91 specimens/m²), when salinity was gradually falling following heavy rainfall.

Priapulida. These were found in the monsoon months of June and Jul. (7.08 specimens/m²).

Cumacea (family-Diastylidae, Diastylis sp.). A few specimens *Diastylis* sp. appeared in Jan., March through May and July Maximum densities (284.58 and 152.52 specimens/m²) occurred in March and April, respectively.

Amphipods (family-Gammaridae and Corophiidae). The second dominant group of amphipods was recorded throughout the study period but in higher densities during Dec. through May when higher salinity condition (17.77 to 35.42%) also prevailed. The peak abundance was recorded in Jan. (4750 specimens/m²) and the minimum (111.25 specimens/m²) in June.

Tanaidacea (family-Tanaidae, Leptochelia sp.). It was the most dominant group and occurred throughout the period of study. They occurred in higher densities in premonsoon months (Jun. to April) during a higher salinity regime (26.84 to 35.42%) with the peak (16125.00 specimens/m²) in January. The registered lower densities in the moonsoo with the minimum in June (236.25 specimens/m²) when salinity was 12.67%.

Isopods (family-Anthuridae). During this year round investigation they were absent only in the months of Dec. and Feb., their peak was in July (117.92 specimens/m²). They registered lower densities in premonsoon months with the lowest in Jan. (20.83 specimens/m²) when higher salinity (26.84%) was recorded.

Molluscs (family-Viviparidae and Mycidae). These comprised the fourth dominant group of macrobenthos, higher densities were recorded in premonsoon months with the peak (1722.08 specimens/m²) in April when a high salinity (28.08%) was recorded. The minimum was in Aug. (7.08 specimens/m²) when salinity was also low (3.49%).

The present investigation records three dominant groups of macrobenthos, the tanaids, amphipods and polychaetes. This is harmonious with the findings of Coleman *et al.* [13] who also recorded these three groups to be the dominant macrobenthic fauna of western port area in Australia.

It is apparent from the results that abundance of marcobenthic organisms was influenced by seasonal changes. Higher densities in premonsoon months (Nov.-April) can be identified with a higher salinity regime (Fig. 2). Subsequently an opposite relationship was found with rainfall. For instance, during monsoon months remarkably lower densities of organisms were recorded in this brackish water pond. This finding differs from that of Rainer [14] who worked on macrobenthic communities of an Australian estuary and found no changes directly associated with reduced salinity after rainfall and inferred that heavy rainfall prior to the sampling period might have reduced the number of species at some sites.

Salinity being the most important factor of a brackish water aquaculture pond, an attempt has been made to find its degree of association with the monthly occurrence of macrobenthic fauna. Regression analysis shows that a significant positive correlation (r=0.873) existed between salinity and density of macrobenthos. Thus the seasonal fluctuations in distribution of different group of macrobenthos were reflective of the salinity changes in the pond. Molluscs strictly maintain a positive relation with salinity. Parulekar *et al.* [15] also inferred similarly.

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