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First Report of Tubuca Rosea at River Ichhamati and Artificial Mangrove Forest Golpata in Its River Bank, Taki, West Bengal, India

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Abstract:
The present study is reporting identification of fiddler crab *Tubuca rosea* from river Ichhamati, Taki in West Bengal in recent time. This study had identified *Tubuca rosea* from the river bank and in a mangrove forest situated around the river Ichhamati. This study also finds the cause of finding *Tubuca rosea* in river Ichhamati in relation with Physico-chemical parameters of river water and soil. Food habit also noted. *Spirogyra* sp is one prime alga in their food habit. Activities of both female and male *Tubuca rosea* were noted on river bank. parameters of river water such as pH, DO, BOD, Conductance, Turbidity, Hardness (ppm), Salinity, TDS (ppm), Total Alkalinity (ppm), etc. and nutritionally important inorganic ions concentration of river water were also evaluated during june, july and august 2023. During this study period presence of *Tubuca rosea* colony was observed in the study area. No previous report of *Tubuca rosea* in this study area was found till date. Findings of these fiddler crab is an indication of changed nature of river ecosystem and also the artificial mangrove forest Golpata which is situated in the river bank also becoming established

Keywords: Ichhamati, Fiddler crab, *Tubuca rosea*, Algae, Physico-chemical parameters.

Introduction

Ichhamati river is known as a trans-boundary river flowing through boundaries between India and Bangladesh and forming the boundary between the two countries [1]. River Ichamati traverses a course of about 216 km and finally discharges into the river Kalindi at Hasnabad in the district of North 24 Parganas and ultimately finds its way into Bay of Bengal near Moore Island as a part of Kalindi-Raimangal estuary in the deltaic southern part of West Bengal [2]. Fiddler crabs inhabit diverse habitats, such as mudflats, sandy beaches, salt marshes, and mangrove swamps, and both sexes build burrows and stay inside the burrows during high tide [3]. Many intertidal organisms, including fiddler crabs, live in dry and exposed environments where they face several environmental constraints during low tide [4-9]. Temperature is one of the main environmental constraints, and extreme high or low temperatures affect their feeding, physiology, growth and reproduction [10-13]. *Tubuca rosea* can be considered as model for time allocation study because they present themselves as highly social animals

and showing excellent social behaviours [14-16]. This can be observed and recorded easily under natural environment [17-18]. Fiddler crabs are considered ecosystem engineers in mangrove sites as they play significant roles in maintaining mangrove ecosystem functions [19-21].

Materials and Methods

2 a. Study area

Water samples from Ichhamati River were collected from 1 sampling point (marked in orange circle) in Taki namely Taki HWGP near BSF camp (22.576971˚, 88.936438˚) and Taki Golpata Forest(22.617763˚, 88.949753˚) of North 24 Parganas, West Bengal, India. The study area circled in orange in the map.

Water sampling and Analysis

The water samples were collected in the month of June, July and August 2023 randomly from River Ichhamati. All the water samples were analyzed using Titrimetry, Flame photometry and spectrophotometric..Onsite measurements of some physico-chemical parameter like pH, Conductance (µS,/cm) , TDS (ppm), Salinity(ppm), Temperature, Dissolved Oxygen were measured by using proper scientific instruments. The water samples were collected in sterile Polymer sampling bottles. Nutritionally important inorganic ion concentrations were measured in the Laboratory. All the instrumental and titrimetric analysis was done at Environmental Chemistry Research Laboratory of Barrackpore Rastraguru Surendranath College.

Soil analysis:

Soil sample was collected from burrow site and moisture dried in the oven at 105^0 C and organic matter of the soil measured by chemical method [22]. pH, Conductance (µS,/cm), Salinity(ppm), were measured by using EUTECH made Multi-parameter PCSTester 35. Nitrate ions were analyzed using Ionometer Sys 460.

Results

Table 1: Month wise data of River Ichhamati water from June-August, 2023.

Parameters		June	July	August
Water Temperature (^{0}C)	Mean	28.16	29.26	32.46

	Std. Div.	0.11	0.11	0.11
DO (ppm)	Mean Std. Div.	8.16 0.05	8.03 0.05	7.93 0.05
PH	Mean Std. Div.	7.45 0.05	7.83 0.01	8.12 0.01
Conductance (µS/cm)	Mean Std. Div.	17774.66 0.57	18643.33 5.77	22130.66 11.54
Salinity (ppm)	Mean Std. Div.	8526.66 11.54	9643.33 5.77	10586.66 11.54
TDS (ppm)	Mean Std. Div.	15513.33 11.54	16366.66 11.54	14663.33 5.77
BOD (ppm)	Mean Std. Div.	1.76 0.07	1.73 0.05	2.16 0.11
Total Hardness (ppm)	Mean Std. Div.	460.02 0.07	168.03 0.08	172.39 0.00
Turbidity (NTU)	Mean Std. Div.	318.33 0.57	298.66 1.15	302.23 0.57
Total Alkalinity (ppm)	Mean Std. Div.	214.33 1.15	221.66 0.57	218.66 1.15
Carbonate Alkalinity (ppm)	Mean Std. Div.	8.66 0.577	6.33 0.57	8.33 0.57
Bicarbonate Alkalinity (ppm)	Mean Std. Div.	205.66 0.57	211.66 0.57	210.33 0.57
Carbonate ion (ppm)	Mean Std. Div.	4.76 0.57	6.33 0.57	4.43 0.11
Bicarbonate ion (ppm)	Mean Std. Div.	250.10 0.10	258.65 0.02	254.44 1.17
Sodium (ppm)	Mean Std. Div.	104.78 0.27	111.62 0.23	112.39 0.03
Potassium (ppm)	Mean Std. Div.	12.10 0.10	13.08 0.02	14.96 0.03
Calcium (ppm)	Mean Std. Div.	327.66 0.57	312.33 0.57	316.33 0.57
Nitrate (ppm)	Mean Std. Div.	1219 1.73	1317.66 0.57	1412.66 1.15

Table 2: Monthwise data of River Ichhamati soil from June-August, 2023.

Parameters		June	July	August
PH	Mean Std. Div.	7.71 0.07	7.93 0.02	8.16 0.05
Conductance (µS/cm)	Mean Std. Div.	15568.66 10.40	16783.33 5.77	18208.33 7.63

Salinity (ppm)	Mean Std. Div.	6973.33 5.77	7893.33 5.77	8910 10
Nitrate (ppm)	Mean Std. Div.	1166.66 5.77	1265.00 5.00	1353.33 5.77

DISCUSSION

Golpata Forest or Mini Sundarban in Taki West Bengal is an artificial mangrove forest. Fiddler crabs deal with temperature fluctuations in their habitats through developing several morphological, physiological, and behavioural adaptations [23-25]. The mean temperature of river water of Ichhamati ranges between 28.16^{0}C to 32.46^{0}C throughout study period and is suitable for the habitat of *Tubuca rosea*. The mean pH value of River Ichhamati was slightly alkaline, ranging from 7.45 to 8.12. The mean value of conductance ranged between 17774.66 – 22130.66 µS/cm. Salinity plays important role in their growth and reproduction [26]. The mean value of salinity lied between 8526.66 to 10586.66 ppm during study time. Total Dissolved Solids or TDS mean value remained between 14663.33 – 16366.66 ppm. This range of salinity and TDS physiologically making this portion of river as an intertidal zone and suitable for mangrove growth. This is one reason that this portion of river Ichhamati is gradually becoming a suitable habitat for *Tubuca rosea*. Algae are one of the prime foods for fiddler crab. During the study period it was observed that *Tubuca rosea* build their burrow where colony of *Spirogyra sp*. was present and it was also observed that they were feeding on *Spirogyara.* During study time mean DO value of Ichhamati River ranged between 7.93 to 8.16 ppm which mean the river aquatic ecosystem is suitable for different algal group such as Cyanophyceae, Chlorophyceae, Bacillariophyceae [27]. Organic pollution of water often indexed by Biological Oxygen Demand in water. Mean value of BOD ranged between 1.73 – 2.16 ppm indexing less organic pollution in river water which create suitable environment for aquatic life. Mean hardness of river Ichhamati water ranged between 168.03 – 460.02 ppm. Turbidity of the river water ranged between 298.66 and 318.33NTU. Mean sodium content ranged between 104.78 to 112.39 ppm. Mean potassium ion concentrations ranged between 12.10 to 14.96 ppm which indicates river water is good for green algal development [28]. Calcium ion concentrations range between 312.33 to 327.66 ppm. Previous work indicates that proper nitrate concentration is important factor for algal growth [29]. Mean nitrate ion concentrations of river water ranged between 1219 to 1412.66 ppm. Present study finds that river water is unpolluted during study time and good for growth of green algae and diatoms.

Physico-chemical parameters of Mangrove River soil ecosystem plays important role in the macrobenthic fauna including fiddler crabs [30]. The mean pH value of soil of River Ichhamati was slightly alkaline, ranging from 7.71 to 8.16. The mean value of conductance of soil ranged between 15568.66 – 18208.33 µS/cm. The mean value of salinity lied between 6973.33 to 8910 ppm during study time. Mean nitrate ion concentrations of soil ranged between 1166.66 to 1353.33 ppm. All these physic-chemical parameters result support that the artificial forest Golpata in river bank of Ichhamati is becoming established and is suitable for colony formation of *Tubuca rosea* .

CONCLUSION

Tubuca rosea is a very common mangrove crab and play important role in mangrove ecosystem. There was no previous report of this crab in river Ichhamati but the study area of river Ichhamati has characteristics feature of mangrove forests ecosystem and this is also becoming an intertidal zone. According to local people *Tubuca rosea* colony was observed during last 1year. Soil organic matter also support that this area is suitable for fiddler crab but during the study time it was only observed *Tubuca rosea* and no other fiddler crab. Golpata Forest or Mini Sundarban in Taki West Bengal is an artificial mangrove forest. But it may be concluded that this artificial forest is now establishing itself in this area and changing the ecosystem suitable for mangrove species and in near future the river may be a suitable habitat for fiddler crabs.

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