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Ecology and behavior of Telescopium Telescopium (Linnaeus, 1758), (Mollusca: Gastropoda: Potamididae) from Chemaguri mudflats, Sagar Island, Sundarbans, India

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ABSTRACT: *The ecology and behavior of Telescopium telescopium in the marine mangrove mudflats of Chemaguri, Sagar Island, Sundarbans is described during the period of January 2014 to December 2014.The surface air temperature and flood water temperature vary between 34°C to 24°C and 29°C to 14°C.. The salinity in the habitat was found to vary between 11‰ during monsoon, post monsoon season and 23‰ during premonsoon season. Hydrogen ion Concentration (pH), dissolved oxygen (DO) of flood water have been recorded.*

KEY WORDS: *Ecology, Behavior, Telescopim telescopium, Chemaguri, Community*

I. INTRODUCTION

Among the 60 odd numbers of gastropod species occurring in Sundarbans marine mangrove, *Telescopium telescopium* is a typical large snail and found in abundance and exploring the mudfloors of Indian Sundarbans.It feeds on organic detritus and surface algae and common on the exposed areas of small ditches, shallow pools or canals with a little flow of water during low tide or at extreme high tide mark in the soft mud or on pneumatophores of mangroves. Population (8-10 nos /m²) reaching upto 20-25 in the mangrove environment regions. Eggs are laid in gelatinous mass and juveniles recorded during April-May often found associated with *Balanas sp*. But towards the sea usually found associated with *Saccostrea cucullata* (Dey,A.2009). *Telescopium telescopium*, a mangrove epifauna, prefers to inhabit the muddy substratum of midlittoral mudfloors both within and outside the mangrove forests. They are active during ebb-tide and are usually common on the exposed areas on small ditches, shallow pools or canals or among the pneumatophores of mangroves. These are their preferred habitats where they graze on the rich detritus contributed by the mangrove system.(Haque,H.and Choudhury, A.2013).The movements of individually marked *Telescopium telescopium* in the upper intertidal zone at Bowling Green Bay, N.E. Queensland. At the time of their inactive phase these snails were found clustered together in refuge micro-habitats where the harsh physical conditions were ameliorated relative to those on the exposed mud surface. The timing of activity was related to the total regime, with movement initiated by tidal inundation. There was no evidence of an endogenous component to the activity rhythm. Synchronization of movements with the tidal regime is of vital importance to their survival. The animals left exposed succumbed to heat stress.(Lasiak,T.and Dye, A.H.1986). In length frequency analysis, model were traced for period of two years and the growth was found to be 55 and 95 mm for I and 11 years respectively. Growth determined by months mode curve indicated that *T.telescopium* can grow up to 62, 85 and 110 mm in the I, II and III year respectively. Growth assessed by probability plot was found to be up to 23,57.5, 91 and 108 mm in the 0, I II and III year respectively. Integrated method showed growth rates of 60, 92 and 111.6 mm respectively in the I, II and III year of life. Employing von Bertalanffy's growth equation it was found that it can grow up to 57.5, 91 and 108 mm respectively in the I, II and III year of life. The empirical length at different ages found by von Bertalanffy's growth equation showed general agreement with the growth estimates others. (Sriraman, K., Ajmalkhan, M. and Ramamurthy, K. 1988). Its distribution and density, and brief observations were made on its foraging activities. The study was carried out in 12 mangrove forests, distributed in Java, Maluku and Irian Jaya, Indonesia. The result indicates that the snail occurred at a very low frequency and density. It may be due to its preference to an open area. Its distribution restricted within the forest. The shell is of two forms, the typical and the smooth form. There is a distinct habitat segregation between the two forms owing to the degree of shadiness. The time of activity is related to the tidal regime. The movement begun when animals are exposed to the air. During their inactive phase, these snails are buried into the muddy substrate. The animal are not active simultaneously leads into a suggestion that the snail is able to maintain its feeding activity from its burrow, even during high tide. (Budiman, A. 1988). The present study investigates the ecology and behavior of this ecologically important species in this environment.

II. MATERIALS AND METHODS

Experimental design

Study site

Sagar Island is surrounded by river Hooghly in the north and north-western side and river Mooriganga in the eastern side. The southern part faces the open sea Bay of Bengal. Sagar Island lies between latitude $21^{O}62$" to $21^{O}87$" N and longitude $88^{O}04$"to $88^{O}17$" E. Both the rivers are perennial in naturally bringing large quantities of water and sediment from the upstream of Bhagirathi.Chemaguri lies between latitude $21^{O}63$" to $21^{O}67$" N and longitude $88^{O}12$"to $88^{O}14$" E.

Field sampling of associated macrobenthos

The ecology of *Telescopium telescopium* was studied in the field and in aquaria set up in the laboratory.*Telescopium telescopium* and other macrobenthos in association with this mollusc in the mid-littoral zone of Chemaguri mudflats,Sagar Island were collected during the period of January 2014 to December 2014. Collection of macrobenthos was carried out at four different spots taken at random from this station during each season of investigation. The observations were based on monthly collection during low tide, when the mid littoral zone was accessible for proper investigation.The mollusc and other associated fauna retained in the mud were carefully sorted out on a polythene sheet and counted by hand picking method. Fresh materials have been taken in trays.

Analytical measures

Flood water have been collected to obtain the following physical and chemical parameters: temperature, salinity, hydrogen ion concentration (pH), and dissolved oxygen (DO).The nature of substratum, flood water depth have also studied. Temperature and rainfall (1700mm/year) data have been collected from Meteorological Department, Alipore, Kolkata and S.D. Marine Biological Research Institute, Sagar Island, though day to day temperature were also recorded right from the field during the period of sampling with the help of glass-in-thermometer. Surface air and flood water temperature were measured with a mercury-in-glass thermometer.

Water samples were collected on each visit in a water sampling bottle. The salinity of each water sample was measured with a salinity meter (model EES15-35). Samples of flood water for the estimation of dissolved oxygen content were collected from the bottom with insulated bottle and was analyzed using the modified Winkler's method (Wright,1981). The pH of the water sample was determined with a Philip conductivity meter (model PW 405). The depth of flood water in four randomly selected spots in the study site was measured with a calibrated pole. The samples of these sites have been collected with a Van Veen grab from an unanchored paddle boat. Four grab hauls were taken from the four selected spots of the study site. Each haul was sieved in the field with a 0.5 mm mesh sieve and preserved in 4% formalin and taken to the laboratory where the samples were washed and sorted into taxonomic groups. The top portion of the sediment of the first grab haul was preserved for sediment analysis of size of soil particles using the method described by Hill and Webb. Soil samples from the respective station have been analyzed to measure the characteristics of soil substratum where the animals (i.e., study materials) inhabit.

Photographs

All the photographs of field and macro anatomy of the animal species illustrated in this paper have been taken by a digital camera (Olympus Imazing Corp., Model No.FE-15).

RESULTS

Ecology

Physical variables

The temperatures of surface air and flood water recorded during the investigation period showed a more or less parallel trend of change through the seasons. The maximum and minimum temperatures recorded for surface air and flood water temperature were 34°C, 24°C and 29°C,14 °C ·The flood water temperature were high and remained relatively stable throughout the period of observation, which may indicate that water temperature has no effect on the ecology of *Telescopium telescopium.* The salinity of flood water is the lowest 11 ppt.in the month of September and highest in the month of July 23 ppt. The maximum and minimum dissolved oxygen content in the flood water were 3.9 mg/l. and 1 mg/l in the months June and October respectively.. The amount of dissolved oxygen is an indication of the cleanliness of water a high level correlates with water being clean and unpolluted.

The hydrogen ion concentration(pH) fluctuated during the period of observation. The study site exhibited alkaline properties in the most of the months.

Grazing

The species moves on the mud floors slowly extending its proboscis which grazes the muddy substratum that is mixed with micro algae. After grazing it crawls its body with the help of foot.

Patterns of grazing lines are straight, slightly curvature. The length of trailing mark which was maximum four feet have been observed. Different sizes of species take different time in trailing.

Small sizes of species take long time but big sizes take fewer time.

Community structure

Macroflora

In upper mid littoral marine mangrove flora: *Avicennia marina, Avicennia officinalls, Sonneratia apetala, Acanthus ilicifolius, Dalbergia spinosa, Derris scandens, Derris trifoliate, Exoceria agallocha* In lower mid littotal marine mangrove flora: *Voucheria sp., Catenella repens, Catenella impudica , Nipa fruticans, Porterasia coarctata.*

Macroalgae

Oscillatoria margaretifera, Lyngbya semiplana, Microcoleus chthonoplastes, Enteromorpha intestinali, Enteromorpha prolifera, Ulva lactuca, Chaetomorpha acera, Rhizoclonium hookeri , Rhizoclonium grande.

Macrofauna

Polychates,Gastropoda: *Cerithidea cingulata, Cerithidea obtusa ,Cerithidea alata ,Littoraria (Palustorina) melanostoma ,Littoraria scabra scabra, Nerita articulata ,Neritina (Dostia) violacea* ,Gobid fish:*Boleopthalmus boddiarti* Crustacea: *Carcinoscorpious rotundicauda Trachypleus zizus Onchidium spp. Enhydrus enhydrus* Nemertians: Sipunculida *Fascolosoma archuata* Ghost shrimp *:Thalacina anomela Bivalve:Macoma birmanica* mud squilla *: Scylla cerata Episesarma mederi ,Parasesarma pictum ,Pseudosesarma edwardsi, Uca acuta acuta ,Uca lactra annulipes, Uca dussumieri dussumieri,Uca triangularis Bengali*

Discussion

The temperatures of surface air and flood water recorded during the investigation period showed a more or less parallel trend of change through the seasons. The maximum and minimum temperature recorded for air and water temperatures were 34^0C, 24^0C and 29^0C, 14^0C respectively. The temperature was recorded high in the premonsoon and low during post monsoon seasons and have in annual bimodal temperature oscillation seemed to be a characteristic phenomenon in this ecosystem. Two maxima, one in the premonsoon and other in the monsoon. It is usually a known fact that salinity in the open marine environment does not show any conspicuous fluctuation. The factors affecting salinity are minimum compared to its vast water masses. But in the estuarine environment the salinity is affected tremendously by the additional fresh water freshets from the upstream river and surface run off during monsoon every year. The maximum and minimum salinity recorded for flood water were 23‰ and 11‰ respectively. The maximum value was recorded in the month of July whereas the minimum value was found during in the month of September. The pattern of salinity regime through seasons around Sagar Island environment is as follows: maximum in the month of July which accounts no rain but higher temperature, and was minimum in the month September affected by South-West monsoon winds accompained by heavy rains. The post monsoon period (November to February) may be considered a mixed period because the water is somewhat diluted with the just over seasonal rains, followed by the winter months with minimum records of temperature and precipitation. The values of dissolved oxygen recorded were low throughout the period of observation. The amount of dissolved oxygen is an indication of the cleanliness of water a high level correlates with water being clean and unpolluted. The study site exhibited the hydrogen ion concentration (pH) fluctuated during the period of observation**.** The study site exhibited alkaline properties in the most of the months. *Telescopium telescopium* inhabits the mudflats of the mangrove swamps at the edges of the Sagar Island. The mangrove community occurs on the mangrove plants and in the mudflats of the swamps at the edge of the creeks. In the natural habitat,*Telescopium telescopim* was observed during this study to migrate to the edges of the water and congregates under the tufts of grasses and breathing roots of the mangrove plants which shade it from the direct rays of the sun.

The species inhabits quiet waters where the substratum is muddy and rich in detritus. The preference for muddy deposits may be correlated with the fact that the species is a deposit feeder, taking in mud and digesting the detritus and other organic matter in it. Turbulent waters with fast bottom currents have sandy deposit containing little organic content.

In the laboratory the species was observed crawling to the water edge in the aquarium and keeping part out of water and was never permanently submerged. The amphibious habit observed in this study. Also the tolerance of high temperature and extreme dryness when they are exposed at low tide may contribute to the survival of the species in the shallow waters of the mangrove swamps.

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Fig.1. Mudflats habitat of *Telescopium telescopium*

Fig.2. Population structure of *Telescopium telescopium*

Table1. In average Physical and hydrological parameters of Chemaguri mudflats during January

2014 to December 2014.

Fig.3. Surface air and flood water temperature of Chemaguri mudflats during January 2014 to December 2014.

Fig.4. Salinity in ppt of Chemaguri mudflats during January 2014 to December 2014.

Fig.5. Dissolved oxygen in mg/l of Chemaguri mudflats during January 2014 to December 2014.

Fig.6. pH of Chemaguri mudflats during January 2014 to December 2014.

Table 1.

Month	Surface air temp.(^{0}C)	Flood water temp.(^{0}C)	Flood water salinity (ppt.)	Flood water DO (mg/l)	Flood water pH
January	23.5	22	18	3.5	8.1
February	29	27	19	2	8.1
March	30.5	27	20	3	8.2
April	31	28	19	3.8	8
May	34	28.5	18	3.8	8.1
June	32	28.5	20	3.9	8.2
July	32.5	27	23	2.5	8.3
August	31	28.5	22	2.5	8.3
September	31.5	29	11	2	8.3
October	30	24	12	1	8.2
November	27	25	15	1	8.1
December	24	14	13	2	8

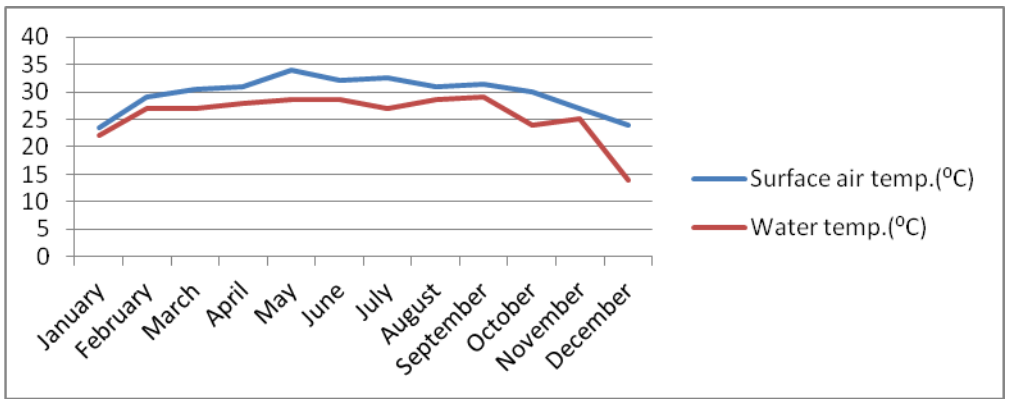
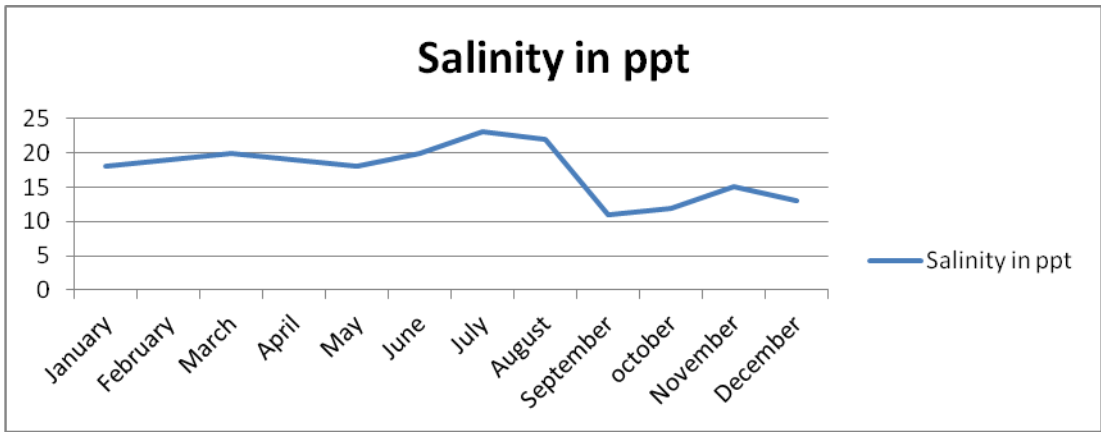


Fig.3.



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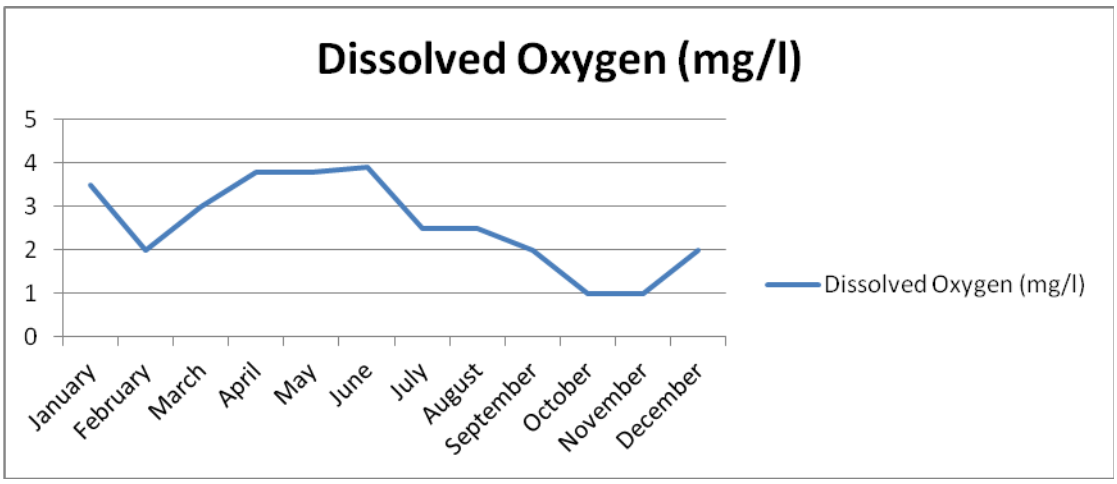

Fig.5.

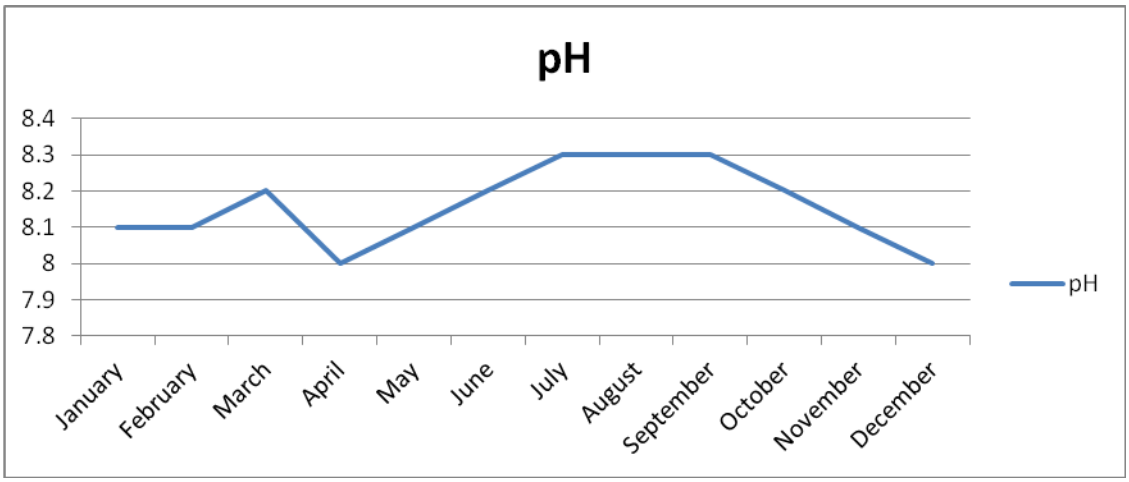

Fig.6.