

Ecology and Behavior of the Ghost Crab, *Ocypode Macrocera* Edwards 1834 Occurring In the Sandy Beaches Of Sagar Island, Sundarbans

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ABSTRACT : Ecology and behavior of *Ocypode macrocera* was studied on the sandy beaches of Sagar Island of Indian Sundarbans. The crabs are widely distributed around the sea facing coastal Islands of Sundarbans. At the main study site of Sagar Island ghost crabs occupy the sand flats zone of about 300 meters wide extending up to infra-littoral ebb-tide mark. There is a positive correlation between the presence of crab burrows and the number of people using section of the beach. The crabs are active both during day and night time. Each crab burrow has a single opening towards the sea. Gypsum slurry burrow casts are J, single tube and spiral shaped. Burrows do not penetrate to the water table. Well soaked sand of their burrows provides the crabs with a thermally stable environment.

KEY WORDS: Crustacea, Decapoda, *Ocypode macrocera*, ecology, behavior, Sagar Island.

I. INTRODUCTION

Semi terrestrial crabs of the genus *Ocypode* Weber, 1795 are typical inhabitants of tropical and sub-tropical sandy beaches (Dahl, 1953; Hedgepeth, 1957) where they occupy conspicuous burrows (Vannini, 1980a). Supra littoral zone is the habitat of *Ocypode macrocera* in Sagar Island region. Burrowing behavior of *O. macrocera* from the coastal zone of Sundarbans has been studied by Nandi and Dev Roy (1996) very briefly. These present authors studied the shore distribution population structure, and burrow shape of *O. macrocera* in Sagar Island and demonstrated that the water content of the sand was the key factor when determined burrow distribution. Burrow morphologies are examined and burrow micro environment has been examined.

II. MATERIALS AND METHODS

Studies were conducted at the sand flats of Sagar Island of deltaic Sundarbans facing Bay of Bengal during March 2012 to February of 2013. *Ocypode macrocera* is present in high density in the upper littoral sand beds of all the sea facing delta lobes. The study site at Sagar Island extends about 300 meters from supra littoral to infra littoral zone and length wise extends about 4000 meters east to west. A total number five quadrat was taken at random to count the burrows number. The diameter of each burrow opening was measured using vernier calipers and burrow openings are arranged in seven size categories (>30 mm, 31-39 mm, 40-50 mm, 51-59 mm, 60-69mm, 70-79mm, 80-90mm). Some burrows were cast by pouring gypsum slurry into them. When the gypsum had set, the casts were carefully excavated by hand and their shape and dimensions were measured. On several occasion, the burrow occupant was trapped inside the cast enabling the crab's size and sex to be determined. *Ocypode* crabs were caught by hand at day time, when they emerged from their burrows. Carapace length and width were measure using vernier calipers and these data were used to investigate morph metric relationships. Measurements of the cheliped dimensions were also taken. Nocturnal observations were made using torch light. Physical and hydrological parameters have been recorded twice in a day. Behavioral observations specially feeding were observed and recorded.

III. RESULTS

Air, water and burrow temperature

The mean air temperatures above the sand surface range in average 21.0C to 30.50C. The water also exhibits daily temperature fluctuations, ranging from a mean of 20.50 C to 30.50C. Surface and burrow temperature ranges from 23.50C to 14.0 C.

Burrows

In this region burrows occurs in a distinct horizontal band. This band extends approximately 200 m horizontally from the edge of the supra littoral zone to upper mid littoral. Each burrow excavated (n=20) contains only one occupant.

Burrow morphology:

Opening diameter of burrows > 30 mm were cast successfully. Details of twenty burrows, derived from casts, given in table 2. All these burrows came from supra littoral that had zone a simple surface opening, oriented seawards. The burrow descended obliquely before leaving out. Eight of burrows were about J shaped whereas the other six were spiral tube and remaining were single tube type out of twenty burrows had the same basic shaped but the horizontal porting extended further and was somewhat sinusoidal. Burrow depth was highest furthest from the sea, because the depth to the water table was higher. The deepest part of the burrow was always located at least 1 cm above the water table.

Relationships between crab size and burrow size:

In order to test whether burrow width reflected crab size, the relationship between carapace length and burrow width was investigated. Since carapace width was the natural dimension recorded for the crabs. Impact of human activity on crab density some part of the sand flats were used for bathing, shopping by pilgrimages and some part of the increasing eco-tourism is one of the factors for habitat disturbance.

IV. BEHAVIORAL OBSERVATION:

Behavioral observations of crab activity surveys showed that they were active both in day and night time. Burrow excavation was observed regularly twice in a day after the receding tide. Sand was repeatedly carried from a burrow and then dispersed much of this sand to a location about 1 m from the burrow. In general crabs were solitary feeders. Feeding behavior consisted of scavenging, predation and deposit. On one occasion we saw, making a line of crabs bearing a long dead snake over holding their head with their claws. It was an example of commensally feeding.

V. DISCUSSION

The air temperatures and water temperatures of Sagar Island beach exhibit large daily fluctuations. The air temperatures are seen to vary between 21.0C and 30.50C. The water temperatures fluctuate between 20.50 C and 30.50C. The great temperature fluctuations observed within the sand column was found at a depth of 45 cm. Where the temperatures ranged from 23.50C to 140 C. Burrow temperature closely follows sand column temperature (Atkinson and Taylor, 1998). The importance of the burrow in providing, ghost crabs with protection from environmental extremes has been discussed by Vannini (1980a); Atkinson and Taylor (1988) and Eshky *et al.* (1988). Crab distribution and population characteristics of *O. macrocera* are found to be widely dispersal around the coast of Bay of Bengal of Sagar Island. There are no significant differences of crab density throughout the year. Difference in zonation between the sexes has been recorded for a number of *Ocypode spp.* (Fellows, 1966; 1975; Horch, 1975; Vannini, 1980a; Eshky, 1985). Burrow depth increases with distance from the sea, reflecting the increasing depth of the water table. An upper limit to their distribution are where the depth of the water exceeds 70 cm. Burrow termination at least 1 cm. above the water table. The variation in burrow shape are seen in a number of ghost crab species has been reviewed by Vannini (1980a) who showed that the burrows of juveniles were either I, J or U shaped whereas those of the adults showed greater variability and included Y and spiral configurations in addition to the burrow shapes shown by juveniles. Each species shows a particular range of burrow morphologies. Burrow of males may differ from those of females as in the case of *O. ceratophthalma* (Fellows, 1966) and *O. saratan* (Linsenmair, 1967, Eshky, 1985). Geographic variation in burrow form has been shown for *O. ceratophthalma* (Fellows, 1966) and may occur in other species. *O. macrocera* shows J-shaped, single tube and spiral burrows in Sagar Island. *O. macrocera* are active both during day and night. Vannini (1976) has reviewed diel activity in *Ocypode spp.* and found most to be nocturnal. Intraspecific variation in peak activity times occurs and may relate to differences in factors such as weather, site, season and crab size (Vannini, 1976; Shuchman and Warbury, 1978). *Ocypode* species feed in various ways. Many deposit feed, leaving characteristic pellets on the sand surface. Some species take plant material and some are active predators (Vannini, 1976, 1980b; Wolcott, 1978; Eshky, 1985). *O. cursor* on Alagadi beach was seen to be both scavenger, feeding on animal carcasses, picnic remains and vegetable matter and a predator, preying upon hatchling sea turtles. *O. macrocera* at Sagar Island beach, are seen to be involved in burrowing activities after receding the tides twice in a day. The activities observed involved the excavation of sand from within the burrow and then scatter the sand on the New Jersey shore; observations of *O. quadrata* have been shown that this species burrows at dawn (Milne and Milne, 1946). The burrowing activity described is similar to that observed for *O. cursor* at Alagadi Sand a number of species; in the case of *O. rotundata* (Pretzmann, 1975) and *O. saratan* (Linsenmair, 1967) they are produced by males to attract females.

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Fig .1. Sand flats habitat of *Ocypode macrocera*



Fig .2.Burrow opening of *Ocypode macrocera*



Fig .3. Spiral tube burrow

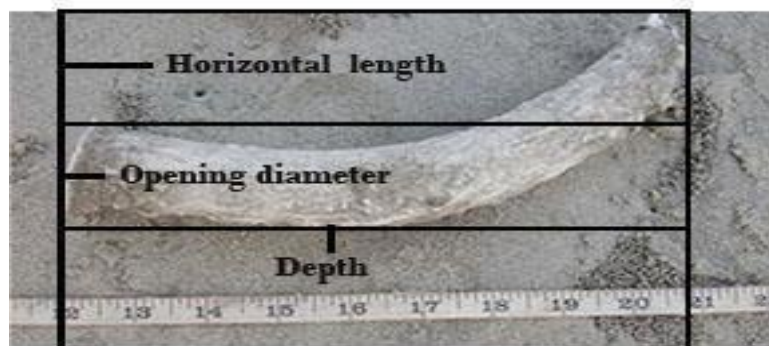


Fig .4. J- shaped burrow



Fig .5 Single tube burrow

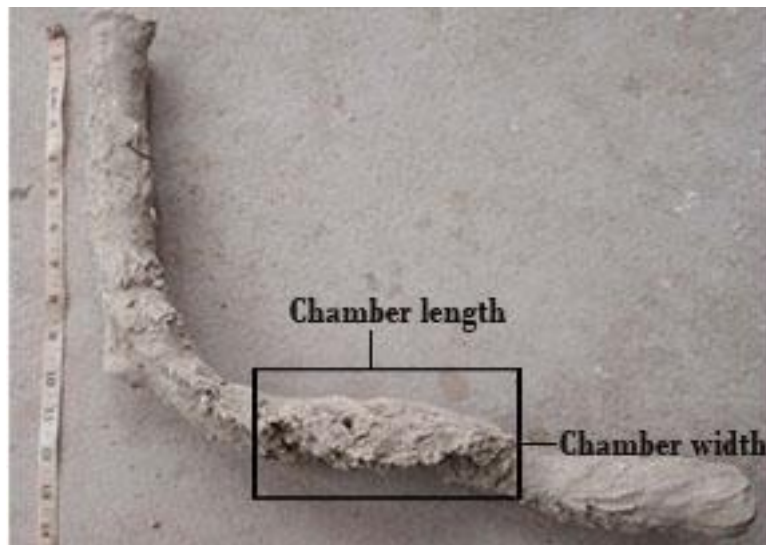


Fig .6 Spiral burrow



Fig.7. Spiral burrow

Single tube	spiral	J-shaped	Number of burrows
6	6	8	20

Table1.Pattern of burrow casts obtained from Sagar Island.

Number of burrows	Quadrate No.
26	1
26	2
22	3
12	4
7	5

Table2. The number of *Ocypode macrocera* burrows recorded 5 quadrates (10 m x 10m) taken at random in the supra littoral zone.

Table3. In average physical and hydrological parameters at south Sagar sand flats during March 2013- February 2014.

pH	DO (mg/lt.)	Salinity (ppm.)	Burrow Temp. (0C)	Water Temp.(0 C)	Air Temp.(0 C)	Months
8.2	2.5	23	22	27.5	29.7	March
8.3	2.5	25	22.5	31.2	30.5	April
8.3	2.7	28	23.5	29.5	30.5	May
8.1	2.9	29	23	30	31	June
7.7	3.2	11	24	30	30.2	July
7.6	3.5	11	23	30.5	30.1	August
7.7	3.5	9	23.5	29.5	30	September
8	3.7	14	21	28	30	October
8.1	3.5	16	23	29.5	29	November
8	3.5	19	14	22.5	22	December
8.1	2.5	19	14	20.5	21	January
8.1	2.5	20	14.5	21.5	22	February