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SOME ASPECTS OF BIOLOGY AND FISHERY OF MUD CRAB, *SCYLLA SERRATA* (FORSKAL) WITH A NOTE ON ITS CULTURE PROSPECTS IN THE SUNDARBANS

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ABSTRACT

The mangrove enriched estuarine rivers, creeks and canals of the Sundarbans provide a congenial habitat for the mud crab, *Scylla serrata*. A good number of crab fishers are engaged in the trade of capturing crabs from the wilderness throughout the year with their indigenous trapping devices. The present paper aims to highlight some aspects of their biology with special reference to sex dimorphism, morphometrics and habitat ecology. The efficacy of the different trapping systems are examined. The cultural prospects of this crab in the Sundarbans are also discussed.

INTRODUCTION

THE green crab or the mud crab, *Scylla serrata* (Forskal) spends a considerable and critical part of its life cycle in and around the mangroves. The Sundarbans which is densely enriched with mangrove vegetations offers a suitable shelter for these crabs. This crab, locally known as *nona kankra*, appears to be the largest known crab species from the nearshore and brackishwater habitats of India and is relished throughout south-east Asia. Due to its large size and high quality meat, *S. serrata* has gradually opened up new horizons for its export in the world market as reported by Shanmugam and Bensam (1980). The Sundarbans, with its large rivers, innumerable estuarine creeks and canals, offers a potential resource for lucrative mud crab fishery. A good number of crab fishers are involved in this flourishing trade to earn their livelihood. Indigenously devised crafts and gears are successfully employed by these local crab fishers to tap the vast resources of mud crab.

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Various workers such as Chacko (1956), Chhapgar (1962), Chonchuenchob and Pripanapong (1993), Dev Roy and Nandi (1991), Dutta (1973), Hora (1935), Joel and Raj (1980), Nandi and Ghatak (1985), Nandi and Pramanik (1986), Pillai (1951), Prasad and Neelkantan (1988), Sukumaran *et al.* (1968) and Thomas (1972) studied different aspects of the mud crab. The present study deals with some aspects of biology, trapping systems and fishery prospects of *S. serrata* in the Sundarbans.

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MATERIAL AND METHODS

The present work on the biology and capture methods of *S. serrata* was carried out in the Sundarbans region lying between 21°30′N to 23°00′ N latitude and 88°E to 89°E longitude. The study period extends from January to December 1992. For studies on the relationship

between carapace width and body weight, a total of 121 specimens with carapace width varying between 21 mm to 150 mm and body weight varying between 5 g to 720 g were taken into account. For sex-ratio studies a total of 644 specimens were considered. To investigate the nature of crab holes, a total of 360 burrows were studied. The physico-chemical properties of the water present in the holes were analysed following standard method (APHA, 1980). The data on various trapping systems such as *doan*, *holes* and *thupa* were randomly collected from both the upper and lower zones of the Sundarbans.

RESULTS

Biology

Carapace width - body weight relationship: This relationship was studied in both the sexes of *S. serrata* separately. A total of 74 males were studied in which the carapace width varied from 21 mm to 150 mm and the weight varied from 5 g to 720 g. The regression equation for the above relationship in males was estimated to be :

$$W = -167.5786 + 4.1131\ CW$$

Where W is the total weight of crab and CW is its carapace width. The correlation coefficient (r) was found to be 0.9186 and is highly significant at 1% level (t = 19.72) which proves a high degree of correlation between these two parameters.

In the 47 female crabs studied, the carapace width ranged between 47 mm to 125 mm while the weight ranged between 20 g to 300 g. The regression equation for the said relationship in females was W = -177.5933 + 3.3593 CW. The correlation coefficient was found to be 0.9440 and is highly significant at 1% level (t = 19.19) which indicates strong relationship between the two variables.

TABLE 1. *Sex ratio in different months in Scylla serrata*

Months	No. of crab examined	Percentage of males	Percentage of females
January	20	40.00	60.00
February	40	30.00	70.00
March	18	55.56	44.44
April	120	61.67	38.33
May	130	72.31	27.69
June	16	75.00	25.00
July	30	66.67	33.33
August	36	66.67	33.33
September	50	52.00	48.00
October	44	45.45	54.55
November	60	40.00	60.00
December	80	30.00	70.00
Pooled	644	54.04	45.96

Sex ratio

Table 1 shows the monthly distribution of sex ratio of *S. serrata*. The present investigation reveals that the monthly distribution of sex is disproportionate. During March to September, the males formed the bulk in the collection while in January, February, October, November and December females were more numerous. However, the final analysis showed that the males contributed 54.04% and the females 45.96% of the total catch during the study period.

Ecology

Characteristics of crab hole : A total of 360 burrows were investigated during the present study. During the investigation it was observed that out of these 360 burrows, 66.67% were occupied by the mud crab while the rest 33.33% were empty. Studies also revealed that 91.67% of the total number of burrows had only one opening while the rest 8.33% were with two openings. The diameter of the openings of the holes varied from 4 cm to 10 cm while the depth ranged between a minimum of 25 cm to a maximum of 90 cm.

Physico-chemical properties of hole water: Analysis of the water of holes revealed interesting data. The temperature of water varied between 27°C to 29°C; dissolved oxygen content was found to vary between 2.2 ppm to 2.4 ppm; dissolved carbon dioxide content was found to be high with a minimum of 10 ppm and a maximum of 20 ppm; salinity variations were from 18 ppt to 20 ppt and the pH of the hole water was found to be slightly alkaline which varied between 7.5 to 8.

Fishery

Scylla serrata is caught by the crab fishers of the Sundarbans with a variety of indigenous devices. However, the use of a particular gear varies from place to place. The three most common methods employed for crab collection are (i) *Haar suti* or *Doan*, (ii) *Gutka suti* or *Thupa suti*, (iii) collection from holes by a bent 'sik' or iron rod.

(i) *Haar suti or Doan* (Fig. 1A) : This fishing line is most commonly used for trapping *Scylla serrata*. A *haar suti* is a long hard rope usually made up of strong nylon material, the length of which varies from 275-686 m at different places. The *haar suti* is provided with 0.15 m long nylon ropes called *phansi* which are suspended from the *haar suti* at 0.6 m intervals. The *char* or bait is tied at the free end of the *phansi*. A sinker, usually a broken piece of brick, is suspended at an interval of every 40 *phansi*. A float is provided at one end of the *haar suti* while the other end is attached to a *dinghi* (a country boat) which itself acts as a float. The non-mechanised wooden *dinghi* measures about 10.7 m in length and 2.1 m in width. The concave central portion or belly of the *dinghi* is quite spacious and measures about 3 m in length. The belly of the dinghi is used for storing the collected crabs. It is guarded by a thick net to prevent the escape of the crabs. The most commonly used bait for the crabs is dry baby sharks locally known as *Kamot*. A kilogram of dry *kamot* is usually made into 170-175 pieces and each piece is used as a single bait. A major advantage of using *kamot* as bait is its tough skin which cannot easily be cut by the crabs. Besides this, low quality sea fish like eels, flat fish, mud skippers etc. are also used as bait during the summer.

A group of 2-3 members operate the *haar suti* at daytime during high tides for 8-10 days at a stretch. In the month of December and January, when collection is comparatively high, the operation is also conducted at night. The *haar suti* is laid out from the dinghi along narrow creeks and canals locally known as *suti khal*. After 10-15 minutes, the baits are checked and the crabs holding on to the baits are collected by a small triangular net locally known as *chhankon jal* (Fig. 1B). At the end of the collection, the *haar suti* is again laid out in a nearby *sutikhal*. Usually, during a single high tide, this operation is carried out 3-5 times. In the evening, the crab fishers washes the baits with saline water and then by adding fresh salt the baits are prevented from rottening. The collected crabs are also washed with river water in the evening for keeping them alive. Because of the attacking behaviour of crabs, twigs of mangroves are supplied to divert the attention of the larger crabs from attacking the smaller ones and thereby preventing the loss.

The above practice is adopted by the crab fishers of Kultali and Mathurapur-II in the narrow creeks and canals of the rivers like Matla, Bidyadhari, Thakuran and Saptamukhi.

Studies conducted in the lower zone of the Sundarbans like Jambudwip, Namkhana and Sagar reveald that crab collection is carried out with the help of *harr suti* along the vast shoreline. In this case, the two ends of a *haar suit* are tied to bamboo poles (Fig. 1C) and 2-3 persons take part in the operation. This

method is employed during high tides and the catch is marketed daily. At the beginning of the high tides, the *haar suti* is laid on the beach and crab collection continues until the water level rises to about 0.75 metre when the *haar suti* is again transferred to a shallow water zone. In this way, the placement of the *haar suti* is changed 4-5 times at each high tide. The collected crabs are stored in a bamboo cage called *khancha* (Fig. 1D). The crab fishers of the lower Sundarbans operate the *haar suti* for a period of six days, extending from two days before and three days after each new moon and full moon.

In the upper stretch of the Sundarbans the catch from each successful operation (8-10 days) ranges from 1500-1800 and 800-1000 numbers during August to January and February to July respectively. The catch obtained from the lower stretches of the Sundarbans varies

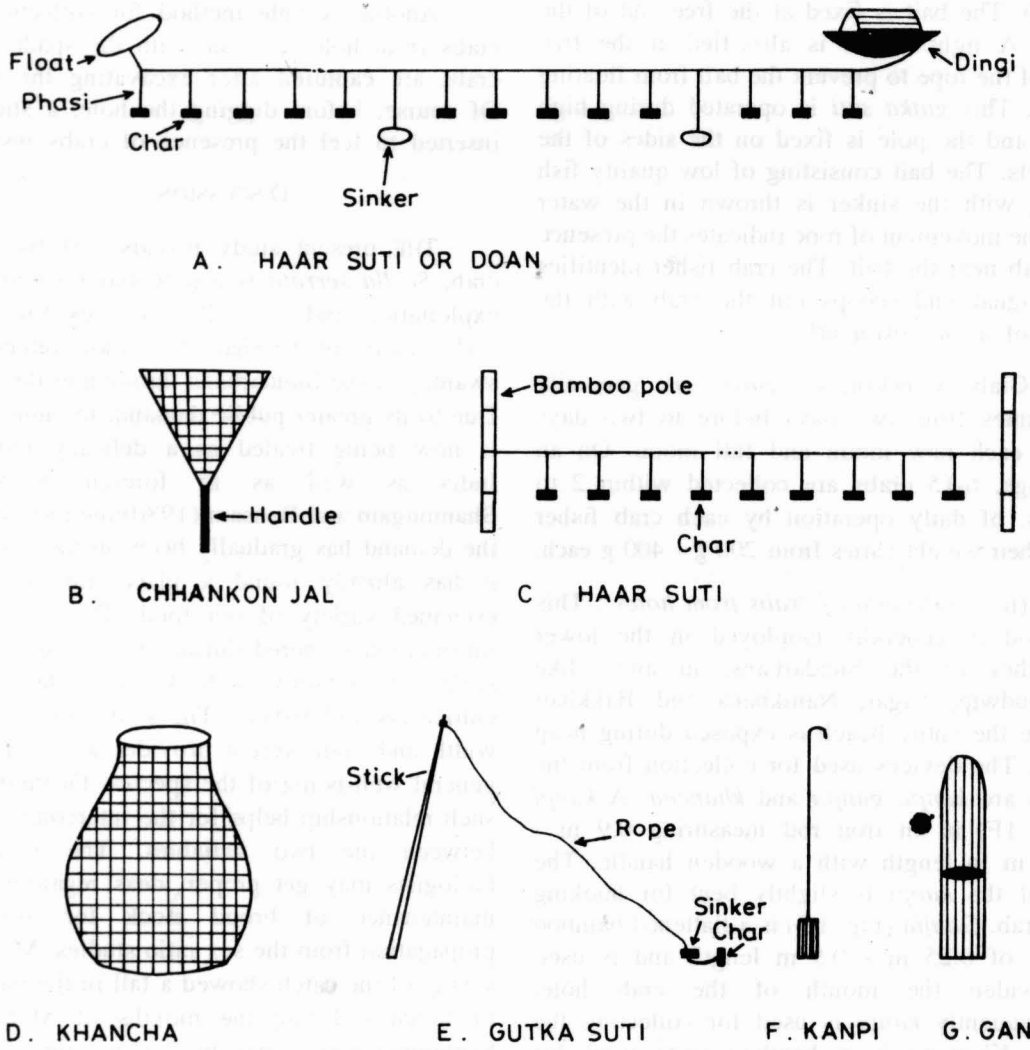

FIG. 1. Diagrammatic representation of different type of crafts and gears (A–G).

from 80-100 per day during July to December and from 40-45 per day during January to June. The weight of the crabs collected by *haar suti* ranges from 200g - 1200 g.

(ii) *Gutka suti or Thupa suti* (Fig. 1E) : This type of gear is common both in lower and upper stretches of the Sundarbans. This method is more popular among the women fishers as the gear is very simple and handy. The device consists of 2 to 4 metre long nylon or jute rope tied to a stick of 0.5 to 1 metre length. The bait is fixed at the free end of the rope. A light sinker is also tied at the free end of the rope to prevent the bait from floating away. This *gutka suti* is operated during high tides and the pole is fixed on the sides of the rivulets. The bait consisting of low quality fish along with the sinker is thrown in the water and the movement of rope indicates the presence of crab near the bait. The crab fisher identifies the signal and scoops out the crab with the help of a *chhankon jal.*

Crab collection by *gutka suti* generally continues from two days before to two days after each new moon and full moon. On an average, 6-15 crabs are collected within 2 to 3 hrs. of daily operation by each crab fisher and their weight varies from 200 g - 400 g each.

(iii) *Collection of crabs from holes* : This method is generally employed in the lower stretches of the Sundarbans, in areas like Jambudwip, Sagar, Namkhana and Bakkhali where the entire beach is exposed during neap tides. The devices used for collection from the holes are *kanpi, ganjia* and *khancha.* A *kanpi* (Fig. 1F) is an iron rod measuring 0.9 m - 1.35 m in length with a wooden handle. The tip of the *kanpi* is slightly bent for hooking the crab. *Ganjia* (Fig. 1G) is a flattened bamboo piece of 0.25 m - 0.5 m length and is used to widen the mouth of the crab hole. Subsequently *kanpi* is used for collecting the crab. *Khancha* is a bamboo cage used for storing the catch.

In the neap tide period the beach becomes exposed and the crab fishers start collecting crabs from the holes for a period of 10 days during low tide in the daytime. The collection reaches a peak during July to December when 30-60 crabs are collected by each crab fisher within 3-4 hours whereas within the same time during January to June each fisher collects about 10-20 crabs. The weight of the collected crabs varies from a minimum of 50 g to a maximum of 800 g.

Another simple method for collection of crabs from holes is done with the spade. The crabs are captured after excavating the hole. Of course, before digging the hole, a stick is inserted to feel the presence of crabs inside.

DISCUSSION

THE present study reveals that the mud crab, *Scylla serrata* is a potential resource for exploitation and as well a species for large scale culture in the shallow coastal waters and swamps of the Sundarbans throughout the year. Due to its greater public demand, the mud crab is now being treated as a delicacy both in India as well as in foreign countries. Shanmugam and Bensam (1980) mentioned that the demand has gradually been on the rise and it has already found a place among other esteemed variety of sea food. The biological information gathered during the course of this study will certainly guide the researchers, crab cultivators and fishers. The study on carapace width and crab weight provides a clue to the general well-being of the species. Furthermore, such relationship helps for the interconversions between the two variables. The breeding biologists may get proper ideas regarding the maintenance of brood stock for artificial propagation from the sex ratio studies. Monthly sexing of the catch showed a fall in the number of females during the months of March to September which may be due to migration of the female crabs towards deeper zones for egg

laying, which is also reported in some of the other crustaceans. The study of physico-chemical properties of the water within the hole gives some ideas of ecological conditions of the habitat. This will certainly provide clue to the crab culturists for its culture in confined water bodies. Although the indigenous trapping devices employed by the local crab fishers yields a good catch, there is still scope for better exploitation of the vast crab resources with the use of more scientific trapping gears. More knowledge regarding the capture of crabs is required to avoid indiscriminate catching as revealed by the present investigation. In order to ensure a productive crab fishery throughout the year as well as to maintain the quality of the catch, more stress should be laid on the capture of big-sized crabs and the release of incidental catches of young ones to the surrounding water bodies. This will ensure further growth of the young crabs so as to exploit them at a later stage or they may also be used as seeds for culture. Stress should be laid on the post harvest technology for scientific processing and proper marketing of the captured crabs to make it more acceptable to its consumers and also for further propagation of crab fishery.

The cultural prospects of *S. serrata* has been mentioned by Jhingran (1982), who stated that faster growth takes place under culture condition than in nature. The Sundarbans is naturally gifted with innumerable creeks, canals and backwater rivers. These are fed with saline waters which provides an ideal habitat for the mud crabs. Moreover, the vast coast line with dense mangrove vegetations also offers a favourable environment for these crabs. In addition to these two factors, this region is also rich in S. serrata seeds. Hence, judicious exploitation of this natural resource will undoubtedly offer bright prospects for the culture of the mud crab in brackishwater impoundments of the Sundarbans.

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