2nd year respectively. But the growth of the present species was 17.55 mm, 26.63 and 32.48 mm during 1st, 2nd and 3rd year respectively and longivity of the species is 3 to 4 years. This result agrees well with the longivity of *K. opima* and contradict with the longivity of *M. meretrix* (Jayabal, 1984).

Growth rate at 1st and 2nd year was high when compared to 3rd and 4th year which is similar to that observed earlier in Porto Novo waters (Kalyanasundaram and Kasinathan, 1983; Jayabal, 1984).

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ARTHROPOD FAUNA OF LITTORAL ZONE IN TWO ISLANDS OF HOOGHLY ESTUARINE COMPLEX, WEST BENGAL, INDIA

ABSTRACT

This study analyses the species composition and density of macro-arthropod fauna of four littoral zones, two each in Chuksar Island and Sagar Island. Characteristics of these zones were the dominance of insects, specially staphylinid beetles.

IN RECENT TIMES, the studies on marine and estuarine littoral ecology has gained immense momentum in tropical and temperate zones. In India, the pioneer work on benthos was

done by Annandale (1907), Choudhury *et al.* (1980, 1984), Bhunia and Choudhury (1981); and Nandi and Choudhury (1983) initiated studies in Hooghly estuarine complex. But all these studies bypassed the presence of insects in the littoral zone. Not only in India, but all over the world, insects have been ignored as an estuarine or marine component (Cheng, 1976). Although insects are reported along the seashores, but there is considerable lack of literature related to the ecology of marine insects (Wong and Chan, 1977). This has tempted the authors to study the insect dominated littoral zones of the said estuary.

Authors are grateful to the authorities of S. D. Marine Biological Research Institute, Bamankhali, Sagar Island and to the Director, Z.S.I., Calcutta.

Materials and methods

The present survey was conducted in Chuksar Island and Sagar Island, situated between 21°30'N and 22°15'N and 88°0'E and 89°5'E.

TABLE 1. *Abiotic factors at four stations*

	Soil-tempe-ture (°C)	Soil-mois-ture (%)	Water salinity (‰)
Station I ..	22	22.8	21.53
Station II ..	25	19.7	22.70
Station III ..	27.5	14.4	16.49
Station IV ..	25	9.2	14.89

At first, the collection spots were identified by the marks of reworked sand on the exposed sandflats. Building of small mounds were caused mainly by the activities of staphylinid beetle which dig tunnels at the time of receding tide (Smith and Hein, 1971 ; Evans *et al.*, 1971). Samples were collected during the post-monsoon months (November to February, 1983-84) with the help of a corer, covering 25 cm^2 surface soil. In each station, three 1 m^2 plots were marked and five samples were collected from each plot. Repeated removal of soil from exactly the same place during consecutive fortnight collection was avoided.

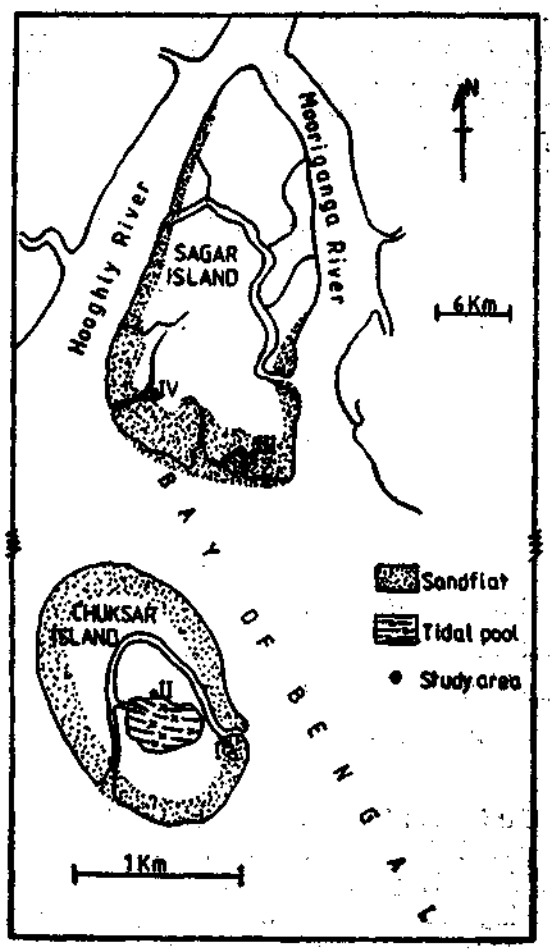

FIG. 1. The position of study areas at Chuksar Island and Sagar Island.

Soil temperature, soil moisture and water salinity was measured during the time of sampling.

Statistical analysis such as relative abundance, dominance index and spcies diversity index was calculated by using standard accepted formulae (Odum, 1971).

Description of collection sites

Station I: This station was situated in Chuksar Island which was completely uninhabited by man. The island was traversed by a narrow creek and the actual collection spot was at the mouth of the creek (Fig. 1). The collection area was totally devoid of any plant life and experienced heavy wave action. Twice a day the area was inundated by tide water.

Station II: The narrow tidal creek which traversed the Chuksar Island made a considerable tidal pool at the heart of the island. During ebb it was completely exposed and got inundated during flowtide. In this station collections were made on the bank of the tidal pool (Fig. 1), *i.e.*, on the hygropsammon zone which was just beyond the waterline. Substratum of the sampling area was muddy due to gradual deposition of silt. The nearby vegetation was very poor and represented only by grass and succulents *e.g. Porteresia coaretata, Salicornia* sp., *Sueada* sp. and *Ipomia* sp.

Station III: It was located in the southern part of Sagar Island. Collections were done by the sides of a small blind channel (Fig. 1) originating from Gangasar Creek. This area was partly surrounded by large stable dunes which was mainly covered by two creepers *viz. Ipomia* sp. and *Launia* sp. Dune base was covered by a spiny green grass *Porteresia coaretata*. A small patch of luxuriant, but gradually diminishing mangroves existed on the landward side of the main creek. The collection site was inundated during each high tide which lasted for about 1 hour.

TABLE 2. *Relative abundance (%) of different species in four stations*

	INSECTA									CRUSTACEA				ARACHNIDA	
	B. (H.) helferi	*B. (H.) birmanus*	*B. (H.) dilutipenis*	*T. interpunctatus*	*Georysus* sp.	*Tackys* sp.	*Saldapsula* sp.	Dermaptera	TOTAL	*Ampelisca* sp.	*Telorkestia* sp.	*M. intermedia.*	TOTAL	*Lycosa* sp.	TOTAL
Station I	91.6	..	4.2	1.7	..	..	..	..	97.5	1.25	..	1.25	2.5	..	..
Station II	74.4	17.4	6.9	..	..	..	..	..	98.7	..	1.3	..	1.3	..	..
Station III	66.2	19.5	..	..	1.3	..	5.2	..	92.2	2.6	3.9	..	6.5	1.3	1.3
Station IV	56.2	12.4	..	..	..	15.7	..	6.3	90.6	6.3	..	..	6.3	3.1	3.1

Station IV: This site was also in Sagar Island and was situated at the end of a blind channel (Fig. 1) originating from the Beguakhali Creek. Huge sand dunes protecting this spot which were well covered by *Ipomia* sp. and *Launia* sp. Few *Acanthus* sp. and *Salicornia* sp. was also present. On the landward side of the dunes a large (about 10 sq. km) mangrove forest was in existence where *Phoenix* sp. predominate.

Results and discussion

Estuary is a transitional zone between the freshwater and the sea and therefore the typical estuarine forms are unique in their habits. The physical conditions in estuaries are very stressful and the species diversity correspondingly low. But estuary is a nutrient trap and so this region is packed with life. Insects were the most successful group to occupy the present sites of investigation. In all four stations the relative abundance of insects were more than 90% (Table 2). Among insects *Bledius* (*Hesperophilus*) *helfert* population always headed the list (Fig. 2). B. (*H.*) *birmanus* was present in station II-IV and occupied a major portion of the insect fauna. Another staphylinid beetle *B.* (*H.*) *dilutipenis*, was recorded from both the collection sites of Chuksar Island, but totally absent in Sagar Island. *Trilophus interpunctatus*, *Georyssus* sp., *Tachys* sp., *Salduncula* sp. and Dermaptera were the other insect species which were encountered only in one station of the four described. Amphipods represented by two species *viz.* *Ampelisca* sp. and *Telorkestia* sp., were present in all four stations. Crabs (*Metaplax intermedia*) were recorded from station I only. Spider *Lycosa* sp. was the only representative of class Arachnida. Both the stations of Sagar Island inhabited by *Lycosa* sp., but the stations of Chuksar Island were devoid of it. In extreme environments dominant species are fewer in number. Station I was subjected to maximum wave action and tidal interplay; salinity was also very high here (Table 1). In station I, dominance index was maximum (84.3%) and correspondingly species diversity index was minimum (0.169). In station II, III and IV, dominance were divided into more number of species and hence dominance indices were comparatively low (Table 3). Species diversity indices

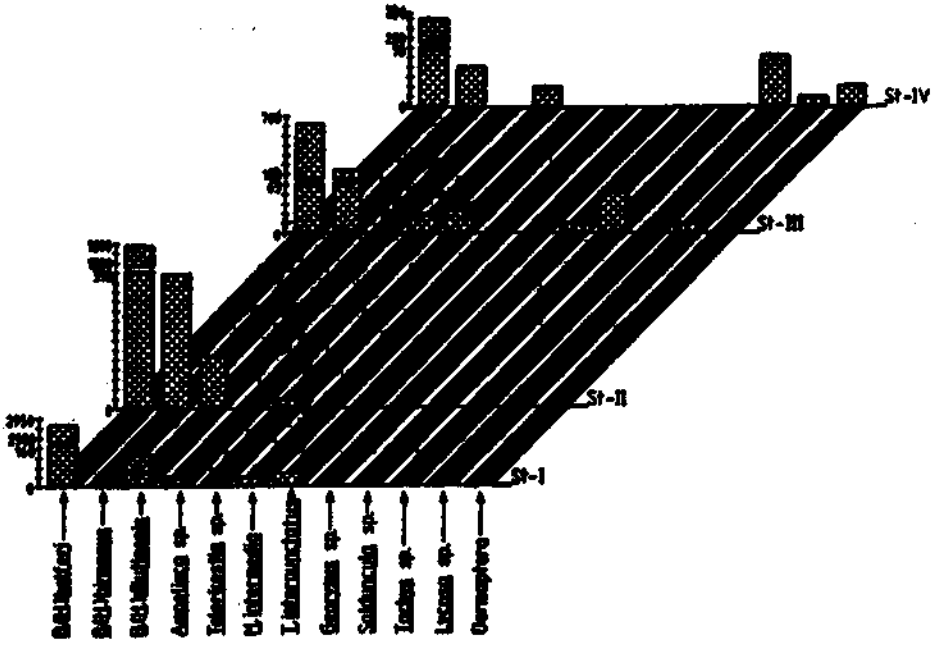

FIG. 2. Population density (No/m²) of different species at four stations.

TABLE 3. *Species diversity index and dominance index of four stations*

	Station I	Station II	Station III	Station IV
Species diversity index ..	0.169	0.332	0.468	0.577
Dominance index (%) ..	84.3	58.8	48.2	36.5

of station II-IV were 0.332, 0.468 and 0.577 respectively (Table 3); it proves that when the effect of the physical factors over environment decreases the number of dominant species as well as species diversity increases. During extreme environmental conditions, only a few species are adapted to it, but they grow maximum in number which might be due to less competition.

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COMPARATIVE STUDIES ON THE FEEDING HABITS OF MARINE AND ESTUARINE CARANGIDS

ABSTRACT

The gut contents of 42 species of carangid fishes occurring at Visakhapatnam on the east coast of India are analysed. Of these eleven species also occur in Godavary and Vellar Estuaries on the east coast. The gut contents of *Alepes djedaba* from Visakhapatnam region, Godavary Estuary and Vellar Estuary and of *Alepes kalla* from Visakhapatnam and Vellar Estuary are compared.

CARANGIDS constitute a commercially important group of fishes along the Indian Coast. The juveniles and subadults of some species are also reported from the estuaries and brakish-water areas where they constitute a fishery. Some of the earlier work done on the food of carangids was based on observations on single species. Chacko (1949) analysed the food of *Caranx hippos* and *Caranx sansun* from the Gulf of Mannar. Bapat and Bal