

STUDIES ON INDIAN KING CRABS (ARACHNIDA, XIPHOSURA)

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Two species of king crabs namely, *Tachypleus gigas* (Müller) and *Carcinoscorpius rotundicauda* (Latreille) occur on Sandy and muddy bottoms from the tide line to a depth of 20 fathoms. They breed in the summer months within the intertidal zone and lay eggs in muddy sand, particularly in creeks of swampy river mouths subjected to tidal influence. As the king crabs carry varied epifauna on the dorsal and ventral surfaces of their bodies, they appear as 'mobile museums of natural history'. Details regarding their taxonomy, ecology, distribution, breeding habits and epifauna are discussed.

The authors while conducting a survey of inshore regions of West Bengal during March, 1966 had the opportunity to collect and observe the habits and epifauna of the well-known king crabs or horse-shoe crabs, *Tachypleus gigas* (Müller) and *Carcinoscorpius rotundicauda* (Latreille) which appear to be common in the intertidal region of Digha (West Bengal coast). The present paper is based on the observations made in the field and on the collections brought back to Calcutta. In addition, the material available in the National Zoological Collections of the Zoological Survey of India have been examined and details of all available published information on these two valid species of king crabs are presented.

Class : ARACHNIDA
Subclass : MEROSTOMATA
Order : XIPHOSURA
Family : Xiphosuridae
Subfamily : Tachypleinae

Tachypleus gigas (Müller)

1785. *Limulus gigas* Muller, *Entomostraca*, p. 126 (in Part).
1802. *Limulus moluccanus* Latreille, *Hist. Nat. Crust. Ins.*, 4, 92.
1902. *Tachypleus gigas* Pocock, *Ann. Mag. nat. Hist.*, 9, 262.

MATERIAL EXAMINED

Burma coast—ZSI, 7332/6, two specimens (caudal spines of both the specimens were broken and the width of the carapace was taken; 138–150 mm), Mergui, date of collection nil, Dr. J. Anderson colls.

Bengal coast—One specimen, 263 mm in total length, sand heads, 8-1-1932, Lady Fraser colls. Two specimens, 270–300 mm in total length, Digha beach, 11-3-1966, Mr. K. V. Rama Rao and Party colls.

Orissa coast—One specimen, 300 mm in total length, Chandipore beach, date of collection and collector not known.



FIGS. 1-2. 1, dorsal view of *T. gigas* showing heavy infestation of *B. amphitrite* and *M. schillerianum* (many specimens removed for preservation and identification); 2, ventral view of *T. gigas* showing the infestation of *B. amphitrite*.

Diagnosis—This species can be identified easily by its triangular caudal spine crested dorsally, concave ventrally; the fourth segment of the sixth prosomatic appendage bearing a movable spur and long lateral spines of opisthosoma. Inner branches of genital operculum not extending distally upto the tips of the outer branches.

Ecology—They occur on sandy and muddy bottoms from tide line to a depth of 40 metres (Annandale 1909; Sewell 1912).

Distribution—It occurs from Bay of Bengal to the Malay Archipelago. In the Indian region it occurs along the east coast of India and commonly along the deltaic coasts of Ganges and Mahanadi (Panikkar 1951).



FIG. 3. Dorsal view of *C. rotundicauda* showing the infestation of *C. stellatus*.

Sexual dimorphism—In males and young females lateral spines of opisthosoma are long but the posterior ones are short in the adult female. The claspers of the male are hemichelate.

Development—Roonwal (1944) recognized nine developmental stages which probably cover about one-half to two-thirds of the incubation period.

Carcinoscorpius rotundicauda (Latreille)

- 1802. *Limulus rotundicauda* Latreille, *Hist. Nat. Crust. et. Ins.*, 4, 98.
- 1902. *Carcinoscorpius rotundicauda* Pocock, *Ann. Mag. Nat. Hist.*, 9, 265.

MATERIAL EXAMINED

Bay of Bengal—Two specimens, 320–330 mm in total length, no specific locality, date of collection and collector not known.

Bengal coast—Two specimens, 300 mm in total length, Sunderbans, 2-5-1961, Mr. A. S. Rajagopal colls. One specimen, 270 mm, in total length, Digha beach, 7-3-1966, Mr. K. V. Rama Rao and party colls.

Diagnosis—This species can be distinguished easily by its round caudal spine, absence of spur on the fourth segment of the sixth prosomatic appendage and the short lateral spines of the opisthosoma. Inner branches of genital operculum extending distally as far as the tips of the outer branches.

Ecology—They occur on sandy and muddy bottoms from the tide line to a depth of 40 metres; also ascends the river Hooghly as far as Calcutta from the open sea and it can live even in fresh waters (Annandale 1909).

Distribution—It occurs from the Bay of Bengal to the Malay Archipelago and Philippines. In the Indian region it occurs along the east coast of India and commonly in the Ganges estuarine system (Annandale 1922).

Sexual dimorphism—In both the sexes the lateral spines of opisthosoma are short, with the second and third spines slightly longer than the rest. In males, the three posterior spines gradually decrease in length while in females these spines end abruptly. The claspers of male are chelate.

Medicinal importance—Local people believe that if a bit of caudal spine is tied around the arm or waist, it will cure all sorts of body pains. Living specimens are brought over to Calcutta and portions of the caudal spines are sold regularly.

BREEDING HABITS

A perusal of the literature on the breeding habits of king crabs, *T. gigas* and *C. rotundicauda* (Willemoes-Suhn 1883 Iwanoff 1907; Annandale 1909; Roonwal 1944; Waterman 1953) reveals that during summer months the king crabs invade the shore in large numbers for copulation. The female carries the male and the eggs are laid in the form of nests, each containing more than 100 eggs, 2–3" below the fine muddy sand and during the egg-laying process the male sheds the sperms over them. From fertilized eggs the larvae emerge out and are carried to the surface waters during the high tide.

In the present survey, male specimens of *T. gigas* were seen with eggs clustered around the abdominal appendages confirming the observations of Annandale (1909) who was of the opinion that the king crabs carry the eggs in clusters around the abdominal appendages until these eggs hatch into larvae.

The notion that king crabs carry eggs as pointed by Willemoes-Suhn (1883) and Annandale (1909) was disproved by the investigations of Iwanoff (1907, 1933) and Roonwal (1944) which showed that the females actually lay eggs in sand or mud, particularly in creeks of swampy river mouths subjected to tidal influence.

As pointed out by Iwanoff (1933) the adherence of eggs to the abdominal appendages of the female may be due to the delayed egg-laying resulting in the accidental expelling of the eggs. Similarly the adherence of eggs to the abdominal

appendages of the male may be accidental occurring at the time of shedding the sperms over the nests of eggs.

EPIFAUNA

As the king crabs or horse-shoe crabs carry varied epifauna on the dorsal and ventral surfaces of the body, they appear as "mobile museums of natural history". No detailed studies have been carried out on the epifauna of Indian king crabs even though their presence has been reported (Roonwal, 1944). In the present study the authors noticed a heavy infestation of ectocommensals on the specimens of *T. gigas* and *C. rotundicauda*. The percentage of infestation of major epifauna of *T. gigas* and *C. rotundicauda* are given below.

	<i>T. gigas</i> %	<i>C. rotundicauda</i> %
Class : ANTHOZOA		
Order : ACTINARIA		
<i>Metridium schillerianum</i> (Stoliczka)	32.8	—
Class : CHAETOPODA		
Order : POLYCHAETA		
<i>Gattyana deludens</i> Fauvel	2.2	—
Class : CRUSTACEA		
Order : THORACICA		
<i>Balanus amphitrite</i> Darwin	31.4	66.7
<i>Chthamalus stellatus</i> (Poli)	—	11.1
Order : AMPHIPODA		
<i>Cheiriphotis megacheles</i> (Giles)	32.2	—
Order : ISOPODA		
<i>Cleantis natalensis</i> Barnard	1.4	—
Class : BIVALVIA		
Order : PSEUDOLAMELLIBRANCHIATA		
<i>Ostrea</i> sp.	—	22.2

Sea anemones—*Metridium schillerianum* (Stoliczka) was observed infesting heavily the dorsal surface of the body of *T. gigas*. ranged from 7 to 14 mm in its column length.

Sessile barnacles—*Balanus amphitrite* Darwin specimens measuring 6.5–18.5 mm, in length were profusely infesting the dorsal and ventral surfaces of the body of *T. gigas* and *C. rotundicauda*. The latter was also infested with a few specimens of *Chthamalus stellatus* (Poli) measuring 8–10 mm in length on its dorsal surface.

Amphipods—Many specimens of *Cheiriphotis megacheles* (Giles) ranging from 3.5 to 7 mm in length were collected while crawling between the abdominal appendages of *T. gigas*.

Isopoda—A few specimens of *Cleantis natalensis* Barnard ranging from 13.5 to 14.5 mm, were collected along with the amphipods.

Polychaetes—Specimens of *Gattyana deludens* Fauvel ranging from 12 to 23.5 mm, were also collected along with the isopods and amphipods.

Brachyura—A few juvenile specimens of *Thalamita* sp., measuring about 5 mm, in carapace width and 3.5 mm, in carapace length were collected from the empty barnacle shells present on the dorsal surface of the body of *T. gigas*.

Bivalves—Many specimens of *Ostrea* sp., measuring 10–20 mm, in length occurred on the dorsal side of the *C. rotundicauda*.

Bryozoa—The incrusting mat-like bryozoan, *Membranipora* sp., was found on the dorsal surface of *T. gigas* and *C. rotundicauda*.

INTER-RELATIONSHIP BETWEEN THE HOST AND THE EPIFAUNA

The sessile barnacles, sea anemones, bivalves and bryozoans probably preferred to settle on the king crabs, since these were suitable substrates along the barren sandy and muddy shores. The mobile host carry the epifauna from one feeding ground to another. The host in return is benefited by concealing itself under the profuse infestation of barnacles, bivalves, bryozoans and sea anemones. The sea anemones may probably further aid the host in protection with their nematocysts.

The amphipods, isopods and polychaetes are probably attracted for eating the egg mass clustered around the abdominal appendages of king crabs. The association of juvenile brachyurans with the empty shells of barnacles is probably for their protection.

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*Not referred in original