

ON THE OCCURRENCE OF REPTILIAN REMAINS IN THE PEAT BED OF BARRACKPORE, 24-PARGANAS, WEST BENGAL.*

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ABSTRACT

Several large vertebrae, a partial skull of a gavial (gharial) and the costal and neural plates of turtles have been collected from a peat bed (1 m thick) exposed near Barrackpore below alluvium (2.6 m) and clay (2.4m). Some of the vertebrae are large and resemble the mid-dorsal vertebrae of *Gavialis gangeticus* as does the skull. A few smaller vertebrae are found attached to the neural plate of carapace of turtle compared to *Chitra indica*. A number of costal plates with rib attachments have been collected.

The occurrence of these fresh water, reptiles in the peat bed of Barrackpore is of significance in the understanding of the depositional environment of the sediments. The present collection of vertebrates confirms earlier suggestions of a fresh water condition of deposition for the peat bed in the same area on the basis of the occurrence of high concentration of *Heritiera* pollen. The palynological study of the present peat bed is in progress.

INTRODUCTION

Since the report of the occurrence of *Heritiera* sp. from the Quaternary sediments of Calcutta by Ghosh (1941) and Sen (1960), much work has been undertaken on the biological make-up of the peat and associated Quaternary layers in and around Calcutta.

Considerable data has been accumulated so far regarding the depositional history of the Quaternary deposit based mainly on wood logs, spore and pollen studies. Wood in most cases have been identified as *Heritiera* sp.

The spore pollen evidence as detailed by Mallik (1969) in his pioneering work on Calcutta peat and the recent exhaustive work by Gupta (1981) along with the reports by Das (1961), Chanda and Mukherjee (1969), Gupta (1970, 1978), Vishnu-Mittre and Gupta (1972), Mukherjee (1972a, b) and Chanda (1974) has revealed facts for understanding the depositional history of the sediments. Gupta (1981) has elaborately discussed about the different phases of deposition, related to the ecological conditions from different profiles.

In the present paper skull and several vertebrae of *Gavialis gangeticus* commonly known as gharial, carapace and vertebrae of one large and one small tortoise identified as *Chitra indica* are recorded from the peat bed exposed at Barrackpore near Calcutta. This is perhaps the first report of occurrence of such reptilian remains in the Quaternary peat bed of West Bengal and is of significance in understanding the ecological condition of the sediments. The palynological work of the peat and associated sediments is in progress.

MATERIAL

The reptilian remains have been collected from Barrackpore (22° 50'N Lat. 88° 18'E long) located about 40 km. north east of Calcutta (Fig. 1). Sub-surface peat deposit has been exposed due to excavation

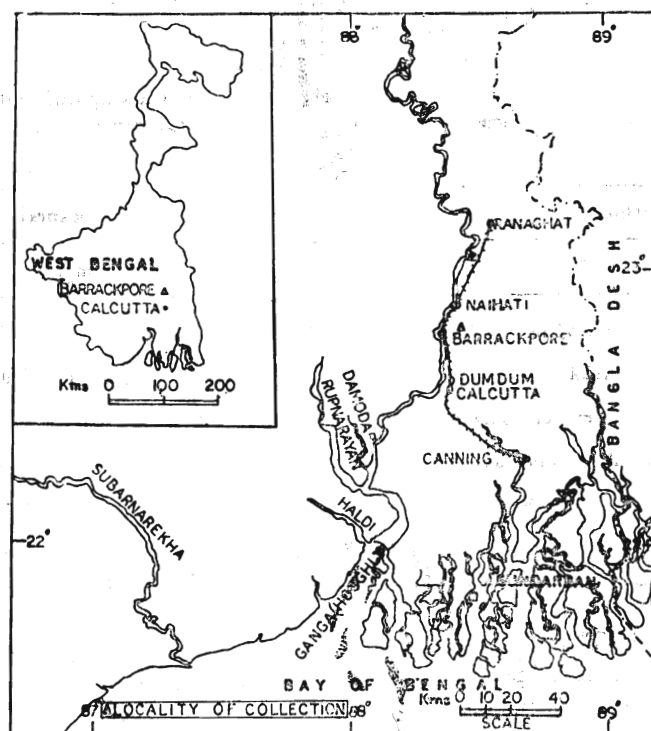


Fig. 1. Showing the locality from where the specimens have been collected.

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in connection with the work of the brick factory in the area. The thickness of the entire section exposed from the surface to the base is about 6.7m. The peat layer containing wood logs and reptilian remains has been found to be situated at the depth of 5.5m from the surface. The thickness of the peat bed is 1 m. The detail lithology of the profile is as follows (Fig. 2).

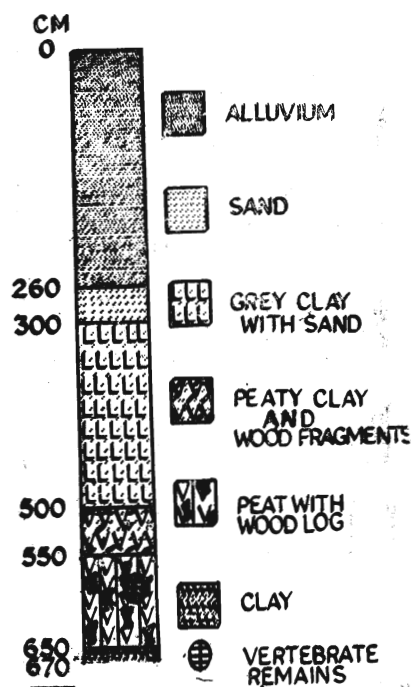


Fig. 2. Vertical section of the exposure showing different lithological sequences and location of the reptilian remains.

Lithology	thickness (metres)
1. Alluvium	0. —2.6
2. Sand	2.6 —3.0
3. Grey clay with sand	3.0 —5.0
4. Peaty clay with wood fragments	5.0 —5.5
5. Peat with wood log and reptilian remains	5.5 —6.5
6. Clay	6.5 —6.7

Three large vertebrae (Sp. nos. PBQA-2, 3, 4), post orbital portion of a large skull (Sp. no. PBQA-1), five costal plates of carapace of a turtle with rib attachment (Sp. nos. PBQA-5, 6, 7, 8, 9) were found lying embedded in the peat bed within a distance of 10 m. approximately (Fig. 2). One complete and two slightly damaged smaller vertebrae are attached to the

neural plate of carapace. The neural plate is flanked by one of the costal plates of the carapace.

The material described here is stored in the Museum of Palaeobotany-Palynology Laboratory, Department of Botany, University of Calcutta.

SYSTEMATIC DESCRIPTION

Order Crocodilia GRAY
Family Crocodilidae GRAY
Genus *Gavialis* OPEL
Gavialis gangeticus GRAY

(Pl. I—1-2, Pl. II—3a-3c, 4 and Figs. 3-7)

Material : Postorbital portion of one skull—Sp. No. PBQA 1.

Description : The anterior portion of the skull is narrow and posterior portion broad. The outline of both the orbits is incompletely preserved. The space between the two orbits is almost flat and relatively broad (120 mm). It is deeply pitted in comparison to the rest of the skull.

The supratemporal fenestra are large and oval in shape (100 mm in diameter). The median area of the cranial table separating the two fenestrae is very narrow (19 mm).

Frontal is almost pentagonal in outline, posteriorly it is flat. Postfrontals are considerably smaller than the squamosals (less than half area of the latter). Post-frontal orbital borders are smaller than the frontal orbital borders.

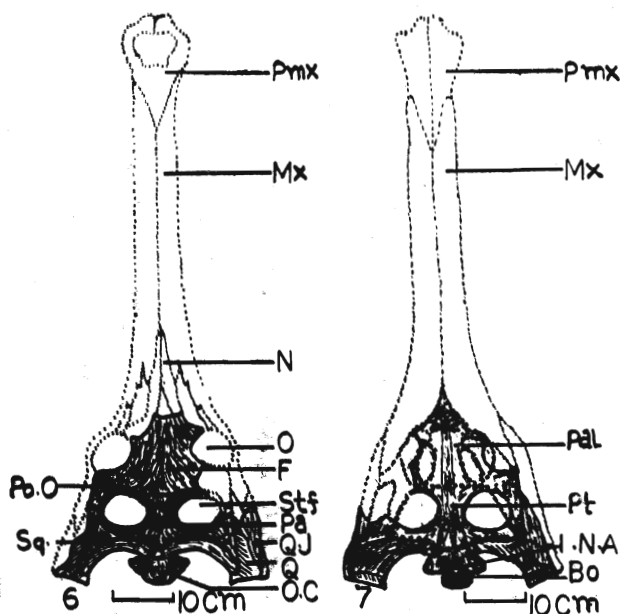
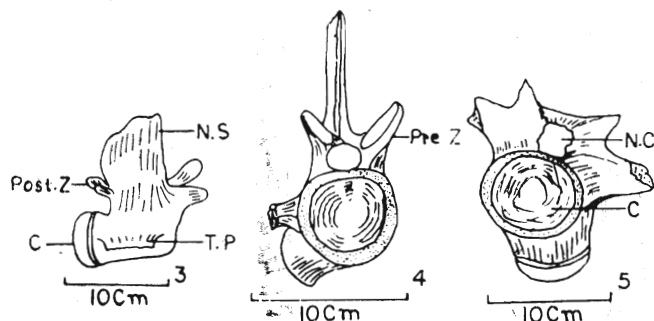
Internal narial aperture is rounded in outline and 35 mm in diameter. Squamosals are relatively long, nearly triangular in outline. Parietal occupies about one third area of the posterior portion of cranial table. It is narrow anteriorly and broad posteriorly with moderate constriction in the middle portion widening immediately below the supratemporal fenestra. Quadratojugal of right side is incompletely preserved. At both the posterior corners of the skull, the quadrates are preserved which are large and fixed (immovable).

On the ventral side of the skull only the occipital condyle, quadrate are well preserved in the specimen (Pl. I—2 and Fig. 7). Pterygoids, palatines and maxilla are not preserved, thus the supratemporal fossa are visible on the ventral side. Single occipital condyle present, basioccipital bears ventrally a pair of prominent tubera (projections) which are large in size (40 mm).

Material : Three large vertebrae—Sp. Nos. PBQA 2, 3, 4.

Description : The vertebrae are of the procoelous type, measuring 85mm-100 mm × 45mm-55mm. The

ball (convexity) at the posterior end of the centrum of one vertebra fits in to the socket of the next vertebra to make a ball and socket joint between successive vertebrae (Pl. II—4); neural spine is projected backward; transverse processes of the centrum incompletely preserved; neural arch with the anterior prezygapophyses and posterior postzygapophyses is preserved in all the vertebrae (Pl. II—3a-3c; Figs. 3-5).



Figs. 3-5. Different views of vertebrae of *G. gangeticus*. Fig. 3. Lateral view, Fig. 4. Anterior end view, Fig 5. Posterior end view.

N. S.=Neural spine. Pre. Z=Prezygapophyses. T. P.=Transverse process. Post. Z=Postzygapophyses. C=Centrum. N.C.=Neural canal.

Fig. 6. Dorsal view of skull of *G. gangeticus*.

Fig. 7. Ventral view of skull of *G. gangeticus*.

Pmx=Premaxillary, Mx.=Maxillary, N.=Nasal, O=Orbit, F=Frontal, Stf.=Supratemporal fenestra, pa=parietal, Q. J.=Quadratojugal, Q=Quadrate, O.C.=Occipital Condyle, Po.O=Postorbital, Sq.=Squamosal, Pal=Palatine, Pt=Pterygoid, I.N. A.=Internal narial aperture. B.O=Basioccipital.

Measurements (in mm) :

Length of Skull (Post orbital portion)	260
Breadth of Skull (Across quadrates)	330

Length of supratemporal fenestrae	100
Breadth of supratemporal fenestrae	85
Length of vertebrae	85-100

Comparison : Skulls and vertebrae of different species of *Crocodylus* and *Gavialis gangeticus* preserved in the Indian Museum, Calcutta have been examined and compared with the skull and vertebrae collected from Barrackpore.

Skull : The skull resembles very much to that of *G. gangeticus* in shape, proportion of length and breadth of the post-orbital region, shape of occipital condyle, shape and larger size (in relation to the orbit size) of supratemporal fenestrae and occurrence of a pair of prominent tubera (projection) in the ventral surface of the basioccipital region; the skull however, is 1.25 times larger in size than the skull of the largest specimen (Sp. No. 13402) of *G. gangeticus* examined in the Reptile Gallery of Indian Museum, Calcutta.

Vertebrae : The larger vertebrae (Sp. Nos. PBQA 2 and 3) correspond with the vertebrae between 14th-23rd and the smaller vertebrae (Sp. No. PBQA 4) correspond with the vertebra between 28th-35th of *G. gangeticus* (sp. No. 13402, Reptile Gallery, Indian Museum, Calcutta). The size of the vertebrae of the present specimens is however 1.25 times larger than the specimen of the museum.

Order	Testudines BUTSCH
Family	Trionychidae GRAY
Superfamily	Trionychoidea FIT ZINGER
Genus	<i>Chitra</i> GRAY

Chitra indica GUNTHER

(Pl. II—5-6).

Material : Three fragmentary pieces of costal plate of carapace with rib attachment. Sp. Nos., PBQA 5, 6, 7.

Description : The incompletely preserved costal carapace measures 140—150 mm in length and 85—95 mm in width. About half portion of each of the carapace is preserved. Each of the costal plate is slightly convex in the middle with a rib attached to the ventral surface (Pl. II—5B). Dorsal surface of the carapace is sculptured by an extremely complicated pattern of wavy dark reticulations (Pl. II—5c).

Measurements (in mm) :

Length of the plate elements of the carapace	140-145
Breadth of the plate elements of the carapace	85-95

Material : One completely preserved costal plate with rib attachment joined to a single neural plate with few vertebrae; one slightly broken part of the costal plate of carapace,

Sp. No. PBQA 8.

Description : A beautifully preserved carapace has been collected which consists of a small bony neural plate having three (one complete and two slightly damaged) vertebrae attached to its ventral surface and along with a large costal plate with the rib attached in its ventral side (Pl. II—6E). The ornamentation of the carapace is similar to that of the Sp. Nos. PBQA 5, 6, 7 (Pl. II, 6D).

Sp. No. PBQA-9.

Description : It consists of slightly broken part of the costal plate of carapace which is similar in all its characteristic features to Sp. Nos. PBQA 8. and PBQA, 5, 6, 7. However, Sp. Nos. PBQA 8 and 9 are relatively much (about half) smaller in size.

Measurements (in mm). :

Length of the plate elements of the carapace	150
Breadth of the plate elements of the carapace	50

Comparison : The plates of the present collection of Sp. Nos. PBQA 5, 6, 7, 8, 9 has been compared with the specimens of turtles kept in the Reptile Gallery of Indian Museum, Calcutta (Sp. no. 31873). In the presence of an extremely complicated pattern of wavy dark-reticulation on the dorsal surface of carapace the specimens are closely comparable with *Chitra indica*.

DISCUSSION AND CONCLUSION

Several attempts have been made so far to build up the Quaternary palynostratigraphy and palaeoenvironments in the Bengal Basin. Das (1961) has reported some of the pollen of mangrove plants along with diatoms from the recent sediments of a pond near Garia characterising both fresh and marine water environments. Mallik (1969) enumerated a list of microflora of Calcutta peat from different localities and presented a pollen diagram from the peat layer which is devoid of the mangrove plants. However, *Heritiera* stems have been recorded from those localities in the clay layer below the peat deposit.

Chanda and Mukherjee (1969) and Mukherjee (1972a, 1972b) constructed several pollen diagrams from upper peat or peaty clay of different localities of lower Bengal Basin. Mukherjee (1972a, 1972b) recorded pollen grains of *Heritiera* and several other spores of swampy and non-swampy vegetation.

Vishnu Mittre and Gupta (1972) have referred the possible occurrence of fresh water *Heritiera* forest in the vicinity of Sankrail and Jangalpore on the basis of the pollen diagrams revealed from the peat bed of the area which contain rich concentration of *Rhizophora* and *Heritiera* pollen grains.

Gupta (1981) recorded three to five pollen assemblage zones from the Kolara, Barrackpore and Namkhana peat and associated sediments. Recently Gupta and Sharma (1982) have reviewed all the pollen assemblage patterns reported from the quaternary peat sediments of Bengal basin by various workers. It is revealed that different ecological phases of vegetational pattern prevailed in the Bengal basin during the late Quaternary period. The environment of deposition varied from fresh water, fresh water with occasional influence of brackish water to brackish water environments.

C_{14} dating reveals that peatification occurred during 7000—2000 years b.p. (Chanda and Mukherjee, 1969, Gupta, 1981).¹ From Barrackpore, Gupta (1981) recorded three palynozones from a peat sediment exposed upto a depth of 375 cm. from alluvium. The zones are I. *Heritiera* dominant zone, II. *Holoptelea* dominant zone and III. Gramineae dominant zone. The lowermost *Heritiera* dominant zone has been suggested by Gupta (1981) to be deposited in fresh water condition with quiet environment and away from sea with least possibility of tidal effect. The occurrence of the *Gavialis gangeticus* and *Chitra indica* at a depth of 570 cm in the peat layer from the same area indicate similar ecological conditions as noted by Gupta in the *Heritiera* dominant lowermost zone.

The ecological condition favoured by these animals discovered in the peat-layer of Barrackpore is of particular importance since the modern habitat of both the genera is known to be restricted to big rivers with much current and without or with occasional influence of brackish water (Biswas, 1970, Smith, 1931). Thus, the peat bed having the animal remains seems to be a fresh water deposit in quiet environment. It may thus be concluded that :

1. Since the aquatic vertebrate remains mostly come from river deposits, the peat sediment of Barrackpore is supposed to be a river deposit.
2. The occurrence of a number of vertebrae as well as skull of *G. gangeticus* and carapace, vertebrae of two different specimens of *C. indica* in the same sediment and within a small distance indicate a natural trap, trapped by sudden flooding.
3. Occurrence of remains of cold blooded reptiles indicate a warm climate at the place of deposition ; big size of the animal indicate that they were liv-

¹Radiocarbon dating reveals the age of the present peat layer of Barrackpore as 3030 ± 100 yrs b. p.—BSIP No.—BS—531. (Kind cooperation of Dr. M. N. Bose, Director and Asst. Director, Dr. G. Rajagopalan of Birbal Sahni Institute of Palaeobotany Lucknow is thankfully acknowledged.

- ving in a favourable ecological condition, with enough supply of food.
4. The presently reported reptilian remains from Barrackpore Quaternary sediments indicate similar fresh water ecological environment reported by Gupta (1981).
 5. The area of deposition might not have been much influenced by tidal water and perhaps was located far from sea.

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EXPLANATION OF PLATES

PLATE I

1. Dorsal view of skull of *Gavialis gangeticus*.
2. Ventral view of skull of *G. gangeticus*.

PLATE II

3. a-c. Different views of vertebrae of *G. gangeticus*.
4. Vertebrae showing ball and socket joint between successive vertebrae.
5. Incompletely preserved costal carapace plates of *Chitra indica*.
(A=Ventral view, B=Ventral view showing rib (R). C=Dorsal view showing ornamentation of carapace).
6. Carapace plates of *G. indica*.
(D=Dorsal view showing ornamentation of the carapace. E=Ventral view showing vertebrae (V) and rib (R).