

A NEW FOSSIL PELOMEDUSID TURTLE FROM THE UPPER CRETACEOUS PISDURA SEDIMENTS, CENTRAL INDIA

SOHAN LALL JAIN

GEOLOGICAL STUDIES UNIT, INDIAN STATISTICAL INSTITUTE, CALCUTTA- 700035

INTRODUCTION

The article, dedicated to the memory of late Professor Y. A. Orlov, Academician, U.S.S.R. Academy of Sciences, describes an uncrushed pelomedusid turtle skull from Pisdura sediments (Upper Cretaceous) of Central India. It is believed to be the only preserved skull material of such a turtle from India. The only other skull along with shell material collected in the mid-nineteenth century has been unfortunately lost since long.

No living pelomedusid turtles are found in Asia. A few sporadic records of such turtles are known as fossils from Asia. These have been recently reviewed by Wood (1970). From India there has been a single good record (Carter, 1852) from Intertrappean beds of Eocene age from the Island of Bombay. Lydekker (1890) commented on this material. In a very exhaustive study Williams (1953) reexamined the description and plates of Carter and made two important contributions: (1) *Testudo leithii* Carter which has long been regarded as a chelid turtle is in fact a pelomedusid belonging to a new genus, *Carteremys* Williams, and (2) the entire material of Carter containing one skull and lower jaw and nine other specimens of carapace and plastron are untraceable and can be assumed to have been unfortunately lost. My enquiry at the Geological Survey of India, Calcutta, reveals that Carter's specimens were not deposited with the Geological Survey at any time. The collections were in all probability deposited with the Bombay Branch of the Asiatic Society.

The new pelomedusid turtle skull was obtained in 1968 from Pisdura sediments a locality south of Nagpur, by the team of the Geological Studies Unit as part of the continuing programme of integrated research. A discussion on the age and environment of sediments from which the fossil has been found follows in the text, assigning the age as not younger than Upper Cretaceous. So far undisputed pelomedusid turtles from Asia are known

from the Eocene of India (*Carteremys*), Pliocene or Pleistocene of Burma, late Eocene of Egypt and early Miocene of Pakistan (*Shweboemys*). The discovery of pelomedusid material in Upper Cretaceous sediments is of considerable interest and significance as the oldest occurrence of that lineage. Being extremely well-preserved the skull material provides interesting palaeontological information about the family Pelomedusidae.

Plastron and carapace material collected over several years from Pisdura and other localities is under examination and will be described in a separate communication.

SYSTEMATIC DESCRIPTION

<i>Order</i>	Testudines
<i>Suborder</i>	Pleurodira
<i>Family</i>	Pelomedusidae
<i>Genus</i>	<i>Carteremys</i> Williams, 1953

Carteremys pisdurensis sp. nov.

Diagnosis: Small pelomedusid with well developed prefrontals meeting medially; nasals lacking; frontals in contact with orbits; extensive emargination of the skull roof from behind; well developed crest contributed by parietal and occipital; parieto-squamosal arch absent; jugal-quadratojugal bar present; *opisthotics not prolonged backwards in sharp crests but small*; vomer extremely reduced; contact between palatines also much reduced. Pterygoids extensively cover palate. Carotid canals well-developed; basisphenoid much elongated anteriorly.

Material: Holotype, ISI R 200; Palaeontological collection, Indian Statistical Institute, Calcutta, India. Nearly complete skull, lacking lower jaw, appx. 39 × 30 mm.

Derivation of the name: The new species has been named after the locality, Pisdura.

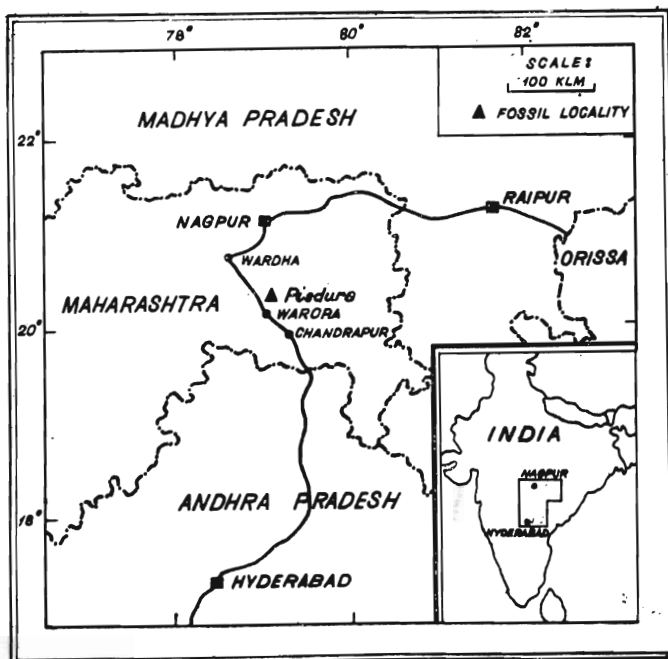


Fig. 1. Map showing the fossil locality. inset: map of India showing locations of important towns in relation to fossil locality.

DESCRIPTION OF THE SKULL

Dorsal view (Fig. 2) : The first noticeable feature of the skull is the extensive emargination from behind.

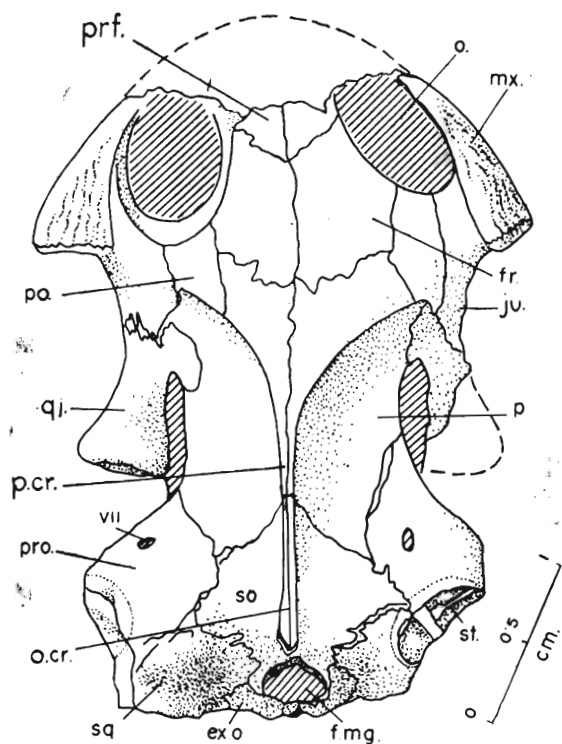


Fig. 2. *Cateremys pisdurensis*, dorsal view of the holotype (ISI R.200) skull, from Pisdura, India.

The parietal crest continues posteriorly as occipital crest which is not preserved completely. The anterior tip of the skull is deficient; the preserved portion indicates that prefrontals were well developed and in contact medially. Frontal, postorbital and jugal are in contact with the orbits, which are oval. The parietal is not in contact with the orbits. Maxillae are fairly well preserved on either side and present rugose surfaces. The parieto-squamosal arch is absent. Jugal-quadratojugal bar is well developed as is typical in most pelomedusids. The occipital region is well preserved but deficient in the condyle; supra-occipital is diamond-shaped and has areas in contact with parietal, prootic, squamosal and exoccipital. There is no contact of parietal with the squamosal on the one hand and exoccipital and prootic on the other hand. The foramen magnum is well marked and bounded on either side by exoccipitals and dorsally by supra-occipital. The foramen for the facial nerve (VII) is seen on the prootics.

Ventral view (Fig. 3) : The palate is unarched and almost straight. Pterygoids occupy very large areas of the palate. Anteriorly the palatines have practically lost all contact with each other, except fractionally, due to long processes from the pterygoid. Vomer is extremely reduced. The nasopalatine fenestra is developed and choana is rather low. The maxillae on either side appear like huge lappets bearing ridge-like margins. These are rugose, bearing depressed surfaces for the attachment of horny beak. The ectopterygoid process is de-

veloped. The presence of large carotid canals on either side, an important pelomedusid feature, is well exhibited. The shape of the basisphenoid is almost like a shark tooth; elongated and pointed anteriorly and widened posteriorly, unlike other pelomedusid genera. The articular surface of the quadrate is somewhat oval. Basisoccipital is moderate in size, not in contact with pterygoids. The opisthotics are small, being adjuncts to large quadratojuggals. The condyle is not preserved.

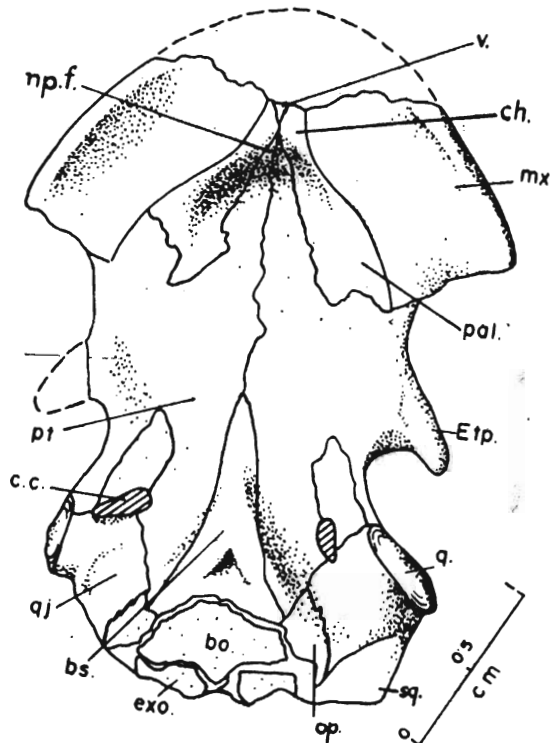


Fig. 3. *Carteremys pisdurensis*, ventral view of the holotype (ISI R.200) skull, from Pisdura, India.

Lateral view (Fig. 4) : The most significant feature is the low profile of the parietal/occipital ridge and an almost straight palate. Jugal does not come into contact with the orbits. The jugal-quadratojugal bar is

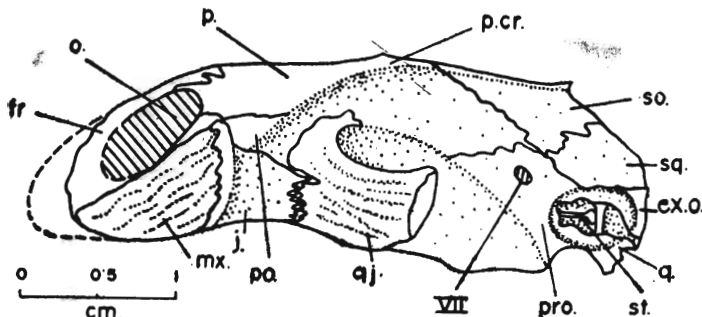


Fig. 4. *Carteremys pisdurensis*, lateral view of the holotype (ISI R.200) skull, from Pisdura, India.

massive but incompletely preserved posteriorly, as in other pelomedusids. The prootic, squamosal and quadrate

surround the otic region firmly. Cavity of the otic capsule is partly exposed on the right-hand side, revealing the *columella auris* (*st.*). This has been restored in the text-figure of the lateral view of left-hand side. The condyle is missing.

Anterior and posterior views (Figs. 5 & 6) : Although the anterior part of the skull is damaged, it is still possible to infer the shape of the front profile. It is flattened at the palatal region and rises to low angles on the sides. Orbits are in contact with the maxillae. Breakage of the anterior end of premaxillae prevents a determination of the shape of external nares. The outline sketch in the text-figure is largely restored but the position of nares

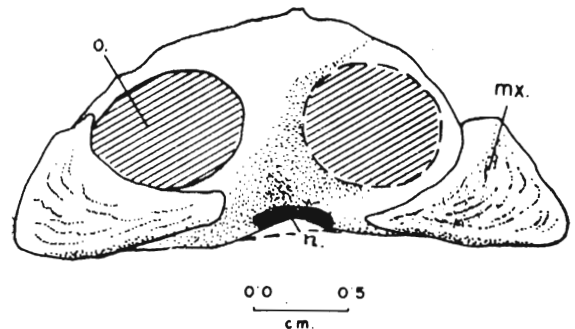


Fig. 5. *Carteremys pisdurensis*, anterior view of the holotype (ISI R.200) skull, from Pisdura, India.

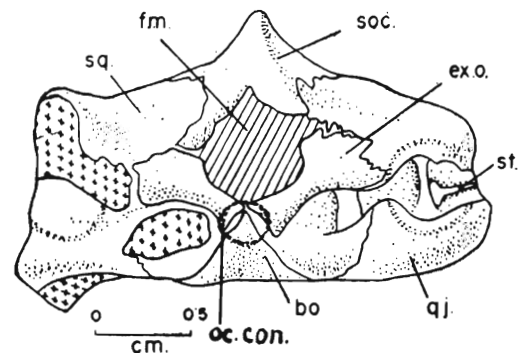


Fig. 6. *Carteremys pisdurensis*, posterior view of the holotype (ISI R.200) skull, from Pisdura, India.

is indicated by the ventral notch. It appears that it was elliptical with transverse axis longest. Posterior view is fairly complete, exhibiting the shape of the ex-occipitals which are narrow ventrally and expanded laterally, being capped by the supraoccipital to form the foramen magnum. The occipital condyle is not preserved.

No remains of the mandible are available.

The skull measures approximately 39 × 30mm.

Occurrence : Pisdura, a locality south of Nagpur (Fig. 1).

Distribution : Upper Cretaceous, India : Pisdura sediments.

DISCUSSION

Carteremys was erected by Williams (1953) to accommodate *Hydraspis leithii* (Carter, 1852) Lydekker, 1890, which he concluded to be a pelomedusid rather than a chelid. Since Carter's material had been discovered by Williams to have been lost, he re-examined the plates and description of Carter and made enquiries about any further collection of material from Carter's locality. Sukheswala (1947, an abstract only) reported the find of a shell (Williams, 1953, Plate 3; on display in Indian Museum, Calcutta) and two other specimens later found by Sukheswala were recorded in the general report of the Geological Survey of India for 1948 (West, 1950); no skull material has been recorded. Carter, unfortunately, gave only a dorsal view of the skull of his material which has been improved upon by Williams by restoring (Williams, 1955; Plate 1) it from the more perfect half. Comparisons are, therefore, beset with limitations of the outline sketch and observations of Williams. Whereas *C. pisdurensis* resembles closely to *C. leithii* in the degree of emargination of the skull roof from behind, its opisthotics are very small, almost as adjuncts to quadratojugals; *C. leithii* has 'opisthotics prolonged backwards in sharp crests'. This morphological character may suffice to distinguish the two species, until fresh skull material from Worli hill, Bombay is brought to light.

The relationships of *Carteremys* within the family Pelomedusidae have been regarded as uncertain (Wood, 1970), mainly because of the lack of reliable information on the holotype of Carter. Further, there is no possibility of improving the same as the material has been, unfortunately, lost. Skull characteristics as exhibited by *C. pisdurensis* can, therefore, be utilised in comparing it with *Shweboemys* and *Stereogenys*; *Podocnemis* (fossil and extant species) being quite distinctive, otherwise. Both *Shweboemys* and *Stereogenys* are morphologically closely related, rather than to any other pelomedusid.

Judging by the size of the skull, *Carteremys pisdurensis* is probably the smallest species and, therefore, there is a general tendency in overall delicate nature of the bones as compared to above genera. *Shweboemys pilgrimi* is 12.5 cms, *S. gaffneyi* is 10.5 cms. and *Stereogenys cromeri* is 8 cms. from snout to occipital condyle (data from Wood, 1970); *C. pisdurensis* is 3.9 cms, but the anterior extremity is deficient. All the same *C. pisdurensis* resembles in some features with *Shweboemys*: (1) the pterygoids do not completely cover the basisphenoid; (2) the lateral margins of the palatines are not parallel to the mid-line axis and; (3) the secondary palate is less elongate. *Carteremys* can be regarded as closest to *Shweboemys* because it is precisely in the above characteristics that it is distinguishable from *Stereogenys*. *Shweboemys* has a broad secondary palate formed by the medial expansion of

maxillae and palatines, with narrow median cleft extending posteriorly from behind premaxillae. In contrast *Carteremys* probably had a very short and narrow secondary palate. The ecology of *Shweboemys* indicates that *S. pilgrimi* was probably a freshwater rather than a terrestrial turtle (Wood, 1970) and *S. gaffneyi* was presumably recovered from a "freshwater formation" (Krishnan, 1960: 492). Comments on the ecology of *Carteremys* follow in the next section.

AGE AND ENVIRONMENT OF PELOMEDUSID LOCALITIES IN INDIA AND PAKISTAN

Present day distribution of pelomedusid turtles is limited to Sub-Saharan Africa, Madagascar and South America. There is ample evidence from fossil records that pelomedusids formerly had a much more cosmopolitan distribution: North and South America, Europe, Africa and Asia. Four localities from where fossil pelomedusid turtle material is known from India and Pakistan are: Intertrappean beds (Eocene) from Worli hills, Bombay (*Carteremys leithii*), Upper Cretaceous Pisdura sediments, Maharashtra (*Carteremys pisdurensis*), Salt Range (Eocene) at Nila in Pakistan (*'Podocnemis' indica*) and Bugti Hills (early Miocene), Pakistan (*Shweboemys gaffneyi*). It may be of interest to compare the fauna and environment and draw general conclusions about palaeoecology of pelomedusids.

Carteremys leithii is associated with the remains of frogs (*Indobatrachus pusillus*) as mentioned by Carter (1852) and as reported by Sukheswala (1947), in later collections. Wood (1970) gave a review of opinions regarding the age of these sediments. Lydekker (1887) regarded them as "lower Eocene", Wadia (1953) as not much younger than the Eocene, Krishnan (1960), on grounds other than palaeontological concluded that the Deccan Traps ranged in age from late Cretaceous to, perhaps, Oligocene. Robinson (1970) concluded that the Intertrappeans are probably mainly early Tertiary. The attribution of an Eocene age to the Intertrappeans of Bombay appears most reasonable and is favoured by Pascoe (1964) and Wood (1970). The sediments were laid down in freshwater and the depositional environment was a shallow marsh (Pascoe, 1964; Krishnan, 1960; Robinson, 1970).

Carteremys pisdurensis is associated with a variety of both invertebrate and vertebrate fossils. There is an abundance of large mollusc shells of *Bullinus prinsepii* and *Paludina deccanensis* and titanosaurian dinosaurs (*Titanosaurus blanfordi* Lyd. and *Antarctosaurus* sp.) represented by individual bones and fragments (Robinson, 1970). Lydekker (1890) also referred to an epiplastral fragment from Intertrappean beds of Lameta as *Hydraspis leithii*, from Pisdura (spelt as Phisdura) near Nagpur as a second occurrence. This specimen was also untraceable in the Geological Survey of India, Calcutta, and has been

probably lost. Wood (1970) mentions that this specimen differs from *Carteremys leithii* Williams in size and in gular proportions and "may well represent an unknown taxon". In the absence of skull material it is not possible to compare it with *Carteremys pisdurensis*. Robinson (1970) suggests a late Cretaceous age in view of the dinosaur fauna and *Bullinus princepii* which is now known to range down into the Upper Cretaceous. There appears to be freshwater environment as evidenced by the molluscs and dinosaurs.

'*Podocnemis*' *indicus* was described by Lydekker (1887) on the basis of a fairly complete carapace and some plastral fragments from Nila in the Salt Range (Eocene) in Pakistan. Until recently (Wood, 1970), there seems to have been no comments on this material. It is understood that there exists too much uncertainty about the exact stratigraphic horizon from which the only known specimen was obtained. Invertebrates have also been found to be associated, in addition to another turtle, *Hemichelys*, which indicate that the beds in which they were found are either of marine or estuarine origin. One of the chelonians is covered with a spat of oysters and the other embedded with shark teeth. The nature of environment is, therefore, clearly indicated. The status of '*Podocnemis*' *indicus*, due to poor preservation, has been concluded as '*incertae sedis*' by Wood, a view which is supported by the present author also.

Shweboemys gaffneyi has been very recently erected by Wood (1970). Locality and other stratigraphic data

has been lacking for the species, but on other considerations, Wood determined an early Miocene age for *S. gaffneyi*.

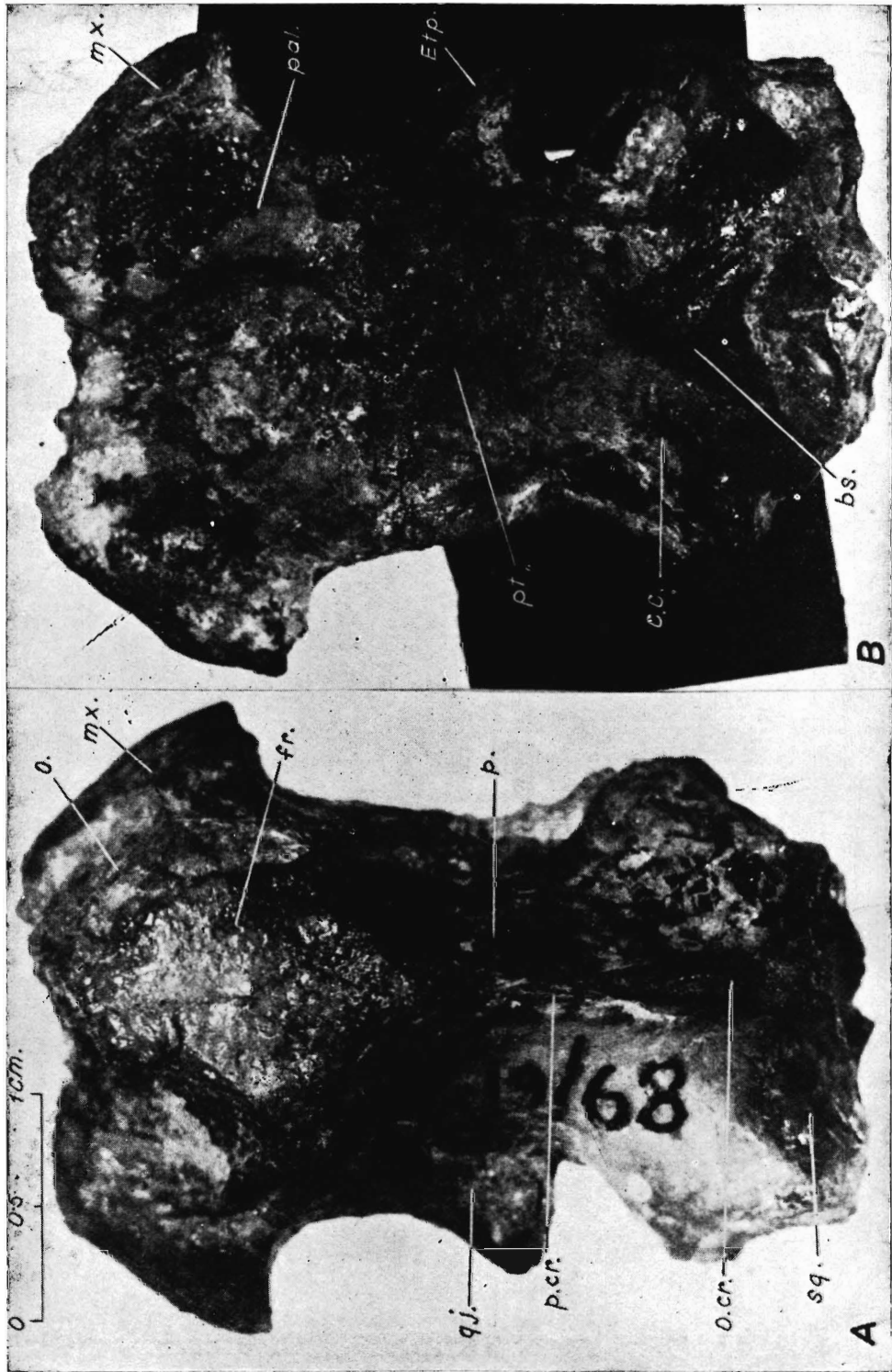
It would be observed, therefore, that there are really only three undisputed occurrences of pelomedusids from India and Pakistan: Worli hills, Bombay and Pisdura beds in Maharashtra, the former being Eocene and the latter Upper Cretaceous in age, and Bugti Hills, Baluchistan (Pakistan) early Miocene in age.

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LIST OF ABBREVIATIONS USED IN FIGURES AND PLATE

bo.—basioccipital	op.—opisthotic
bs.—baisphenoid	p.—parietal
c.c.—carotid canal	pal.—palatine
ch.—choana	po.—postorbital
Etp.—ectoptrygoid process	p. cr.—parietal crest
exo.—exoccipital	prf.—prefrontal
f. mg.—foramen magnum	pro.—prootic
fr.—frontal	pt.—perygoid
ju.—jugal	q.—quadrate
mx.—maxilla	qj.—quadratojugal
n.—nares	sq.—squamosal
np. f.—nasopalatine foramen	st.—columella auris
o.—orbit	so.—supraoccipital
oc. con.—position of occipital condyle	v.—vomer
oc. cr.—occipital crest	VII.—foramen for the facial nerve.



to Dr. Sukheswala for prompt replies to my query, to M/s Dhruba Roy and S. K. De for help towards illustrations, Mr. S. Ghosh for photographs and to the Asiatic Society, Calcutta, for allowing me to examine literature.

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ADDENDUM

Dr. Eugene S. Gaffney (personal communication, 24 Nov. 1975) is in favour of considering this turtle skull material as a new species of *Shweboemys*, rather than *Carteremys*, because of the absence of shell material. He considers that the "only useful character to separate this skull from other *Shweboemys* is the less extensive secondary palate". I had considered *C. pisdurensis* closest to *Shweboemys* but had been hesitant to assign it to the

latter mainly because of the wide disparity in size and robustness.

Some errors have crept in the labelling of illustrations. Figures 2 and 4 should read pterygoid instead of quadrato-jugal, opisthotic instead of squamosal and foramen for stapedia artery instead of facial nerve. Figures 3 and 5 should read quadrate instead of quadrato-jugal and opisthotic instead of squamosal.

EXPLANATION OF PLATE

PLATE I

Carteremys pisdurensis from Pisdura (Upper Cretaceous), India. Holotype skull, ISI R 200 (Palaeontological collections : Indian Statistical Institute, Calcutta). A. Dorsal view ; B. Ventral view.