

OCCURRENCE OF *VENERICARDIA BEAUMONTI* D'ARCHIAC AND HAIME FROM NAREDA, SOUTH WESTERN KUTCH, INDIA

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ABSTRACT

Definite Palaeocene rocks were not known from Kutch. The present investigations of argillaceous rocks at Nareda have yielded a rich molluscan fauna. Presence of *Venericardia beaumonti* d'Archiac and Haime, *Venericardia* cf. *V. vredenburgi* Douville and *Venericardia* sp. A etc. suggests a definite Palaeocene age of these formations.

Very little is known about the Palaeocene rocks in Kutch. PASCOE (1949) was the first to assign a probable Palaeocene age to the Subnummulitic Group of WYNNE (1872) and correlated it with the Lower Ranikot. According to him these rocks chiefly consist of soft argillaceous beds, purple and red mottled with white, of laterites of various kinds, and of coarse sandstone. There are also some shales with leaf impressions, carbonaceous layer and occasional gypsum.

TEWARI (1952, 1957), NAGAPPA (1959) and TANDON (1962) assigned Lower Eocene age to these rocks. Later BISWAS (1965) gave the name Madh Series to these formations exposed at Matano Madh ($23^{\circ}32'37''$: $68^{\circ}57''$). According to him Madh Series is overlying Deccan Traps and has a fossil flora of *Ginkgo bilobaeformis*, *Deltoidospora diaphana* etc. He assigned a probable Palaeocene age to Madh Series and further stated, "...in Sind and Baluchistan Ranikot rocks lie over the Danian *Cardita beaumonti* beds and underlie the Laki rocks. If the order of superposition of beds in both the areas are compared then uppermost Cretaceous, *Cardita beaumonti* beds, correspond to Deccan Traps of Kutch and Lower Ranikot to Madh Series."

The author is not in agreement with the statement of Biswas cited above that the *Cardita beaumonti* beds of Sind correspond to the Deccan Traps of Kutch.

The earlier views are based primarily on stratigraphic considerations without adequate palaeontological evidences in support thereof. The present investigations have resulted in the discovery of *Venericardia beaumonti* d'Archiac and Haime and *Venericardia* cf. *V. vredenburgi* Douville from the argillaceous rocks lying unconformably over the Deccan Traps at Nareda ($23^{\circ}34'30''$: $68^{\circ}41'30''$). The presence of above forms indicates a Palaeocene age of these formations.

In the present paper the classification of Palaeocene rocks is not according to the American Code of Stratigraphic Nomenclature for want of palaeobotanical analysis and units are therefore informal.

Generally the dip of the rocks is in South-west direction and its amount varies in between 4° and 8° . In the lower part the rocks have undulatory dips and are occasionally repeated. The repetition may be either due to rolling dips, it may be an erosional feature or a local folding. About the latter nothing can be said definitely for want of evidence.

Following is the sequence at Nareda:

Bed No. 1: Carbonaceous Shale

It lies unconformably over Deccan Traps or Laterite-Bauxite and is about 1.5 metres in thickness. It has rolling dips and follows the undulatory topography of the underlying Deccan Traps or Laterite. The shales are light grey to black in colour and highly carbonaceous. Just above its base there is a 10-20 cms. thick coaly pyritiferous band. Impressions of leaves are quite common in these shales.

Bed no. 2: Venericardia cf. V. vredenburgi Clay

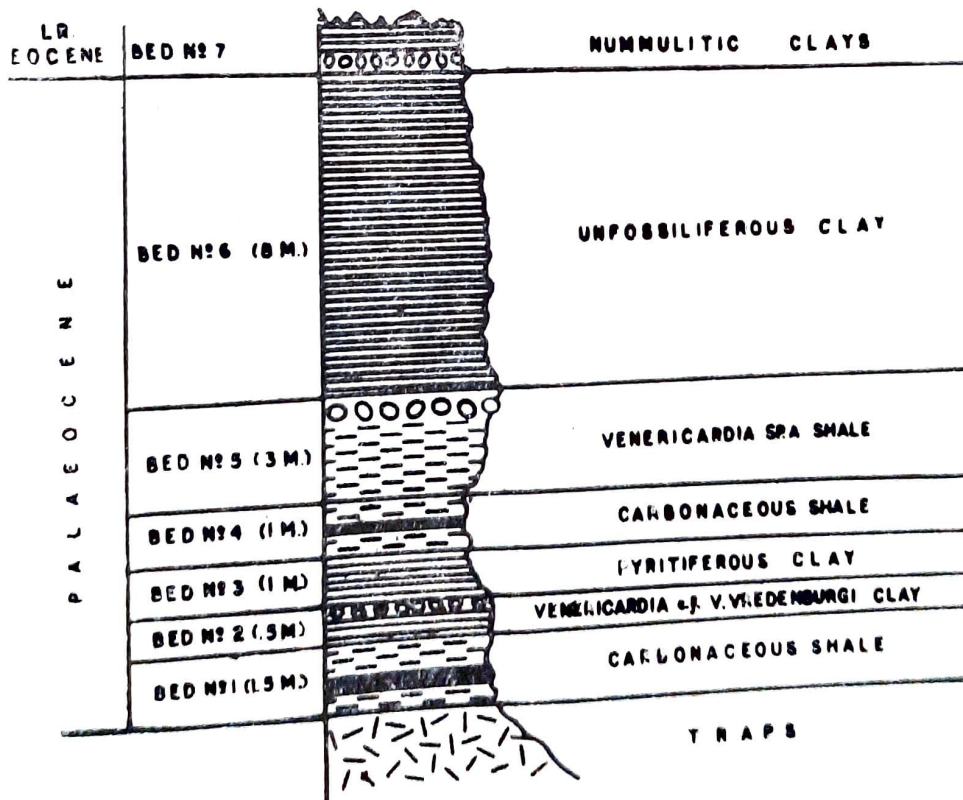
This bed consists of grey coloured clays which lie conformably over carbonaceous shales. It is highly fossiliferous and is about 0.5 metre in thickness. The fossils are highly friable due to the decomposition of pyrites which is present in the clays. At the top there is a 10-15 cms. thick band of calcareous nodules. The nodules are 30-60 cms. in longer diameter, irregular in shape and contain gypsum. At places these clays directly overlie the laterites and have become red and sandy. Occasionally hard calcareous nodules are also found within the bed. These are highly fossiliferous and contain fossil algae and molluscs. Following fossils are present:

Lamellibranchiata: *Venericardia cf. V. vredenburgi* Douville, *Venericardia beaumonti* d'Archiac and Haime, *Ostrea* sp.

Fish teeth, vertebrae and few small foraminifers are also found.

Bed No. 3: Pyritiferous Clay

This bed consists of black clays and lies conformably over *Venericardia cf. V. vredenburgi* clays. It is about 1 metre in thickness and full of pyrites which is present in the form of veins, pockets and lenses. It is massive and crystalline both. Fossils are completely absent probably due to the increase in the amount of pyrites.



Text Fig. 1. Palaeocene succession at Nareda.

Bed No. 4: Carbonaceous Shale

It lies conformably over pyritiferous clays and is about 1 metre thick. Shales are greyish

yellow in colour and have a 4-6 cms. thick carbonaceous band which is limonitic and resinous. The shales have impressions of plant leaves.

Bed No. 5: Venericardia sp. A Shales

This bed is about 3 metres in thickness and lies conformably over carbonaceous shales.

The shales are greyish yellow at the base, pale brown in the middle and red at the top. Gypsum and pyrites are quite common. The bed is full of *Venericardia sp. A*. The calcareous shelly matter of the fossils has been replaced by gypsum which even shows the details of shells such as ornamentation etc. The top of the shales has 20-30 cms. thick band of calcareous irregular nodules which are $\frac{1}{2}$ -1 metre in longer diameter. At times they have a coating of gypsum which is also present inside.

Fossils present are:

Venericardia sp. A, Meretrix sp., Ostrea sp.

Bed No. 6: Unfossiliferous Clay

These clays lie conformably over *Venericardia sp. A* shales and are about 8 metres in thickness. They are pale yellowish brown in colour. At the base these clays have a limonitic coating and are gypseous. In the middle a very conspicuous 4-6 cms. thick limonitic band is present. The clays are unfossiliferous and are unconformably overlain by Nummulitic clays of Lower Eocene age, which at the base have a band of irregular calcareous nodules. It contains fossils of lamellibranchs and gastropods.

The advent of the Palaeocene period in Kutch is marked by a marine transgression from the side of Sind across the region into Cambay as far as Surat-Broach. The Palaeocene deposits are not uniform throughout Kutch. Probably there are several isolated patches extending from Lakhpat ($23^{\circ}49'30'' : 68^{\circ}46'30''$) passing through Nareri ($23^{\circ}40' : 68^{\circ}25'30''$), Nareda and Matano Madh etc. At Nareda the field evidences are suggestive of an undulatory shallow basin more or less near the shore line. This fact is further supported by the presence of bituminous and gypseous shales. The present succession represents estuarine deposits which include both marine and fresh water rocks. Estuarine conditions of the deposition in the lower part are further evident by the presence of grey and black shales and clays, leaf impressions, bitumin, coal, amber and pyrites. The presence of pyrites indicates reducing conditions due to which the fauna became quite restricted in size and variety. There was a restricted circulation of water which may be due to a number of geological factors such as isolation of parts of sea or barred basin. Relic sea might be another feature which restricts the free access to the open ocean. This restriction may be due to physiographic control such as barrier beaches which develop along the coasts. The presence of bitumin is also suggestive of deposition under stagnant conditions. Dark grey or bituminous shales and highly fossiliferous argillaceous rocks on the other hand indicate brackish water conditions. In pyritiferous clays (Bed No. 3) the amount of pyrites has increased very much indicating high anaerobic conditions due to which the flora and fauna could not survive. The black colour of the clays (Bed Nos. 3 and 4) may be due to mineral meilnikovoite which is formed under anaerobic conditions.

In beds number 1 to 5 the shales and clays show swelling and efflorescence which may probably be due to the mineral marcasite. In bed no. 5 the conditions were again slightly favourable for the existence of fauna, although pyrites is present in the shales. *Venericardia sp. A, Ostrea sp., Corbula sp., Meretrix sp.* appear but are quite small in size. After the deposition of *Venericardia sp. A* shale (Bed No. 5) the conditions were again unfavourable and the fauna and flora completely disappeared.

Marked changes in biofacies indicate a rapid change in climate and environment during the time of deposition of the Palaeocene rocks. The larger foraminifers are conspicuously

absent from rocks and sudden disappearance of the fossils from Bed No. 6 may be either attributed to greatly enhanced reducing conditions or highly oxidising conditions becoming prevalent at the time of deposition.

The calcareous nodules are of syngenetic origin and can be used as markers for locating the beds.

SYSTEMATIC DESCRIPTIONS

Class	..	..	..	LAMELLIBRANCHIATA
Sub-class	..	..	..	TELEODESAMACEA
Order	..	..	..	HETERODONTA
Sub-order	..	..	..	CYRENACEA
Genus	..	..	..	<i>Venericardia</i> Lamarck, 1801

Venericardia beaumonti d' Archiac and Haime

Pl. 1, Fig. 2

Test inflated, rounded in front, anterior side very short, posterior side is truncated, umbo curved, strongly rolled inwards. Surface is ornamented with strongly radiating ridges which are about 19-20 in number, 14 or 15 ribs are quite prominent, thick and tripartite. The main ribs bear granulations which are broken.

Length .. 22-23 mm.

Height .. 22-22.5 mm.

Remarks .. The specimens are highly friable hence it is very difficult to isolate them. The specimens described are identical with forms described by DOUVILLE (1928) from Ranikot of Sind and are very rare.

Venericardia cf. V. vredenburgi Douville

Pl. 1, Figs. 3-4

Test small, inflated, umbo incurved, anterior side is short while posterior slightly elongated. Surface covered with 18-20 strong radiating, convex and smooth ribs. They are more prominent and larger on the posterior side, posterior margin crenulate.

Length .. 11 mm.

Height .. 12 mm.

Remarks .. The specimen compares well with *Venericardia* c.f. *V. vredenburgi* described and reported by Douville. The specimen is highly friable hence can not be isolated from the rock matrix. The shells are smaller than the forms described by DOUVILLE (1928) and SARKAR (1964). This fact may be probably due to the prevailing anaerobic conditions in the basin at the Palaeocene time.

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REFERENCES

- BISWAS, S. K. (1965). A new classification of the Tertiary rocks of Kutch, Western India. *Bull. geol. min. metall. Soc. India*. **33**: 1-6.
- DOUVILLE, H. (1928). Les couches à *Cardita beaumonti*. *Mem. geol. Surv. India, Palaeont. indica*, N.S. **3**(3): 1-71.

- NAGAPPA, Y. (1959). Foraminiferal biostratigraphy of the Cretaceous-Eocene Succession in India-Pakistan-Burma region. *Micropaleontology*. **5**(2): 145-192.
- PASCOE, E. H. (1949). *A Manual of Geology of India and Burma*. **3**: 1485-1486. Calcutta.
- SARKAR, S. S. (1964). A revision of the group *Venericardia beaumonti* d'Archiac and Haime found in India, Pakistan and Burma. *Rep. 22nd. Int. geol. Congr. New Delhi*, pt. **3**: 74-87.
- TANDON, K. K. (1962). Fossiliferous Laki beds from Kutch. *Curr. Sci.* **31**: 65-66.
- TEWARI, B. S. (1952). The Tertiary beds of Vinjhan-Miani area, South-Western Kutch, India. *Curr. Sci.* **21**: 217-218.
- TEWARI, B. S. (1957). Geology and Stratigraphy of the area between Waghopadar and Cheropadi, Kutch, Western India. *J. palaeont. Soc. India*. **2**: 136-148.
- WYNNE, A. B. (1872). Memoir on the Geology of Kutch. *Mem. geol. Surv. India*. **9**(1): 48.

EXPLANATION OF PLATE I

1. Section of the calcareous nodule (Bed No. 2) showing lamellibranchs. X ca. 2.
2. Right valve view of *Venericardia beaumonti* d'Archiac and Haime. X ca. 2.5.
3. Right valve view of *Venericardia* cf. *V. vredenburgi* Douville, in the shales. X ca. 4.
4. External mould of *Venericardia* cf. *V. vredenburgi* Douville, in the shales. X ca. 4.6

