

RESEARCH NOTE

POSSIBLE OCCURRENCE OF CRETACEOUS -EOCENE ROCKS IN THE CONTINENTAL SHELF EDGE, OFF MADRAS

Abstract: A well preserved lamellibranch fossil cast belonging to Genus: *Crassatella* of Cretaceous-Miocene age and fossil bearing phosphatic rock pieces were recovered by grab sampling from the continental shelf edge, off Madras. Phosphatic rock pieces contain *Globigerina linaperta* of Upper Paleocene - Lower Eocene age. Cretaceous - Eocene sedimentary sequence of Cauvery basin is occurring on the seabed in continental shelf edge, off Madras.

Keywords : Palaeontology, Cretaceous-Eocene, Continental Shelf, East Coast.

The tectonic origin of Cauvery basin with nearly 5000 m thick sediments ranging in age from Late Jurassic to Recent has been well documented (Sastri *et al.* 1977). It is fragmented into several NE-SW oriented sub-basins and extending into the offshore (Sastri *et al.* 1977). The Cauvery basin broadly described as Peri-Cratonic basin has undergone full cycle of evolution between Late Jurassic and Holocene periods through tectonic and sedimentary phases commencing with 'Rift' followed by 'Post Rift', 'Shelf Sag' and 'Shelf tilt' (Prabhakar & Zutshi, 1993).

During the seabed survey off Madras-Mahabalipuram (Cruise No: SM-80) with the Geological Survey of India's Research vessel *R.V. Samudra Manthan* a lamellibranch fossil cast was recovered (Sample No. 4297, Lat. 13°00. 430'N; Long. 80°36. 982'E) in association with coarse highly biogenous nodular clayey sand and dark brownish grey rock pieces by grab sampling from the continental shelf edge at 195 m isobath (Fig. 1).

Bathymetric transect along 13°00' latitude off Madras proves that the continental shelf is 45 km wide and smooth with a gradient of 00°30' and breaks at 200 m isobath. The upper slope is rugged with linear down-slope gullies and ridges. Sub-bottom profile through 3.5 KHz echosounding indicates two layered structure in shelf edge, in which the harder sub-bottom layer (SL) is irregular indicating an erosional surface (Fig. 2A, B & C). A thin veneer of recent sediments lies over the acoustically harder sub-bottom layer (Fig. 2A, B & C). The hard irregular sub-bottom layer (SL) crops out on to the sea floor in the shelf edge zone.

The mega fossil cast (Fig. 3 A & B) an internal mould of a lamellibranch is smooth, trigonal, measuring 2.5 cm long from anterior to posterior border. The umbones, lunule and escutcheon are prominent and well preserved. The ornamentation is obliterated and the valve margin appears finely crenulated. It is dark grey in colour, non-calcareous and exhibits no signs of transportation or corrosion.

<u>Systematic</u>		<u>Description</u>
Phylum	:	Mollusca
Class	:	Lamellibranchia
Order	:	Eulamellibranchia
Family	:	Crassatellidae
Genus	:	<i>Crassatella</i>
Age	:	Upper Cretaceous-Miocene

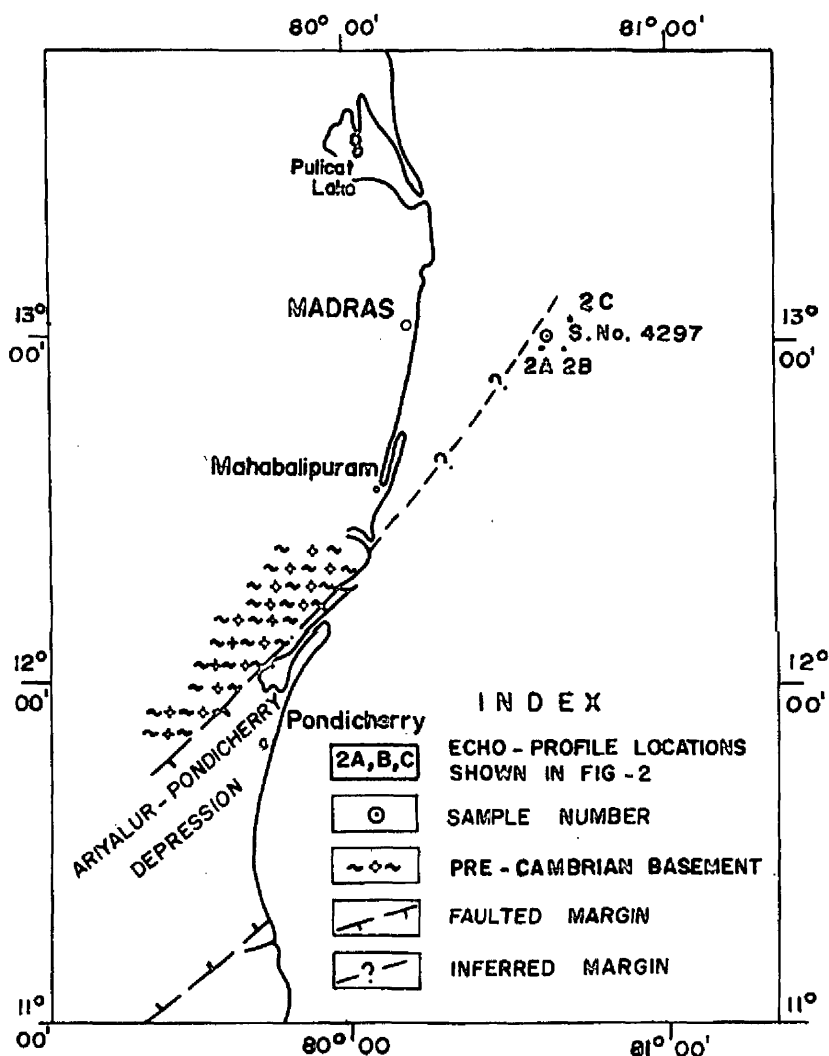


Fig. 1. Map showing sample location, offshore extension of Ariyalur-Pondicherry depression and locations of features shown in Fig. 2.

The rock pieces recovered are dark brownish grey coloured, pitted, dull, irregular with sub-rounded edges and measuring 1 to 5 cm. The polished sections of rock pieces reveal the presence of round to ovoid black peloids of 0.25 to 0.50 mm size, fine sand sized quartz grains and fossils of planktonic foraminiferal species *Globigerina linaperta* (Finlay, 1939) belonging to Upper Cretaceous - Lower Eocene age. The rock pieces are mostly non-calcareous and the chemical analysis of the same indicates 19.98% P_2O_5 . XRD analysis confirms the presence of carbonate apatite and fluorapatite.

Discussion: Echo profile reveals that a veneer of soft recent sediments lies over a hard, well indurated, irregular sub-bottom in the continental shelf edge. The hard sub-bottom layer

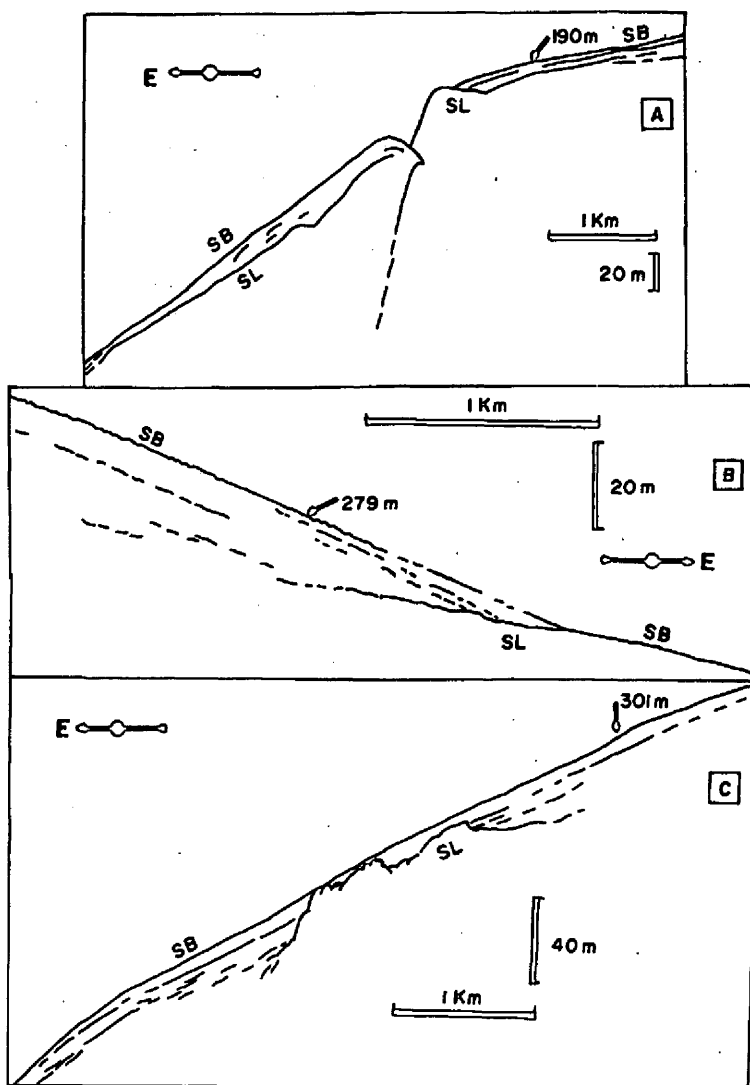


Fig. 2. Echoprofiles (3.5 kHz) from shelf edge zone. A-hard sub-bottom layer (SL) projecting to the seabed (SB), B - Sub - bottom layer (SL) crops out at the foot of acoustically transparent layer, C - Irregular sub-bottom layer (SL) crops out to the seabed (SB).

intermittently crops out in the shelf edge domain (Fig. 2 A, B & C) off Madras. The recovery of *Crassatella* fossil cast and phosphatic rock pieces with *Globigerina linaperta* from 195 m depth indicate the exposure of fossil bearing Upper Cretaceous - Eocene rocks in the vicinity. The absence of any signs of transportation or corrosion over the fossil cast rules out its derivation from coastal tract. In the light of the above findings, the review of geology of the adjacent coastal tract assumes importance.

The NE-SW oriented Ariyalur-Pondicherry depression with Cretaceous - Recent sediments forming the northernmost part of the Cauvery basin is well described (Sastri *et al.*

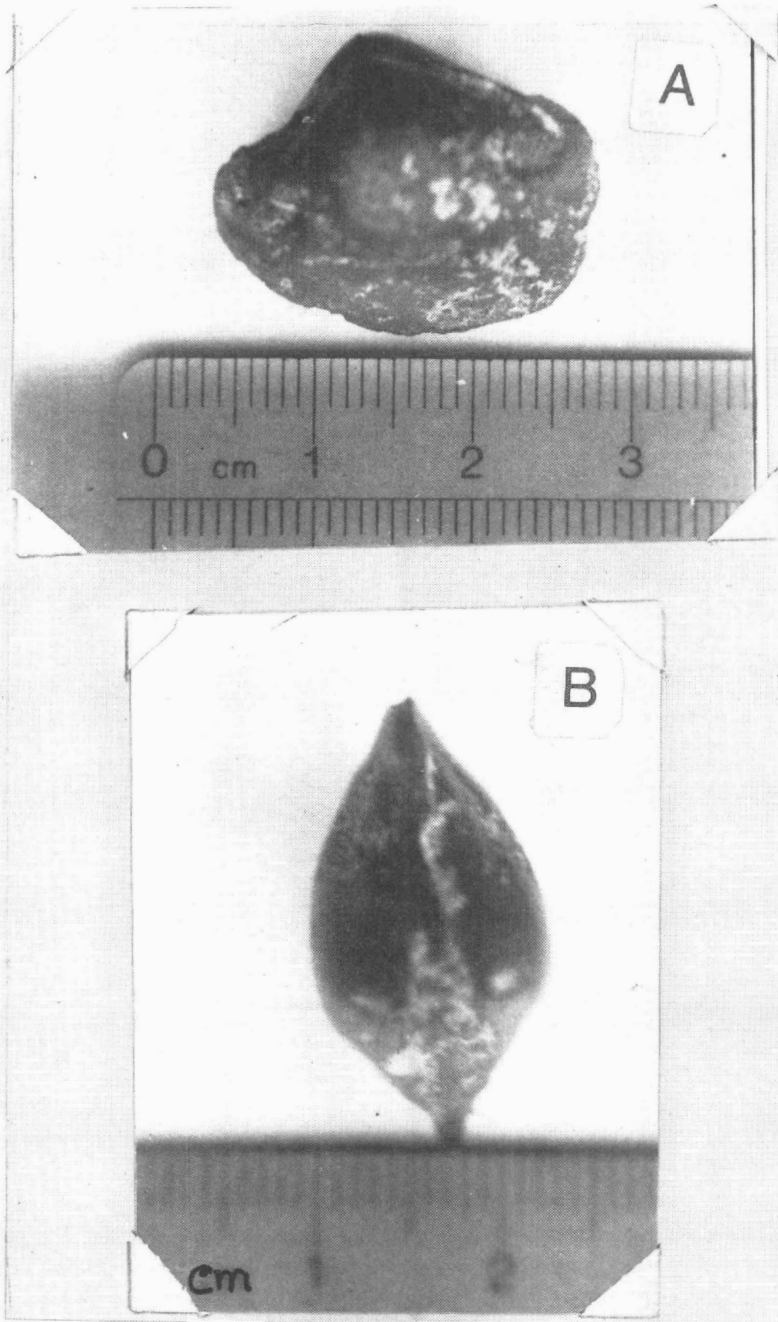


Fig. 3. A - *Crassatella* fossil cast - whole view, B - View from umbones.

1977). The northwestern faulted margin of the depression is abutting against the Precambrian rocks. In the area NNW of Pondicherry, Horizon-D of Ariyalur stage of Cretaceous age is well

exposed and contains sandy shale with abundant phosphatic shell casts (Pascoe, 1959; p. 1243). Further, the Niniyur Stage around Pondicherry yields phosphatised *Crassatellites zitteliana* (Pascoe, 1959; p. 1256, 1259). The occurrence of *Globigerina linaperta* in Upper Paleocene-Lower Eocene sequence of Cauvery basin has been reported (Sastri *et al.* 1977).

The northeastward offshore projection of the northwestern faulted margin of the Ariyalur - Pondicherry depression is quite likely to intersect the continental shelf margin around 200 m isobath off Madras, where the Upper Cretaceous - Eocene sequence is believed to crop-out (Fig. 1). Also it is surmised that the northwestern margin of the depression is extending northeasterly in a curvilinear fashion (Fig. 1), the observation agreeing well with the recovery of well preserved Upper Cretaceous - Miocene fossil cast and the phosphatic rock pieces with Upper Paleocene-Lower Eocene planktonic foraminifera. The finding of mega fossil cast without any signs of transportation points to a nearby source. It is likely that the fossil cast and the fossil bearing phosphatic rocks are derived from the Upper Cretaceous-Eocene sedimentary sequence occurring on the seabed in the shelf edge off Madras.

Acknowledgements: The authors express their gratitude to Shri P. R. Chandra, Deputy Director General, Marine Wing, G. S. I., Calcutta for his keen interest and encouragement in the present work. Authors thank Smt A. Bhattacharya, Director, Central Palaeontological Laboratory, G. S. I., Calcutta for identification of the mega fossil cast. Thanks are due to Shri S. Neelakantam, Director, Marine Wing, G. S. I., Visakhapatnam for going through the manuscript and suggestions.

*East Coast Operations-II,
Marine Wing,
Geological Survey of India,
41, Kirlampudi Layout,
Visakhapatnam - 530 017.*

G. G. VAZ
N. R. BISWAS
P. PRABHAKARA RAO

(Received: 13 November 1993; Revised form accepted: 6 June 1994)

References

- PASCOE, E. H. (1959) A manual of the Geology of India and Burma, V. II, pp. 1243, 1256 & 1259.
PRABHAKAR, K. N. and ZUTSHI, P. L. (1993) Evolution of southern part of Indian East Coast Basins, J. Geol. Soc. Ind. V. 41, No. 3, pp. 215-230.
SASTRI, V. V., RAJU, A. T. R., SINHA, R. N., VENKATACHALA, B. S. and BANERJI, R. K. (1977) Biostratigraphy and Evolution of the Cauvery Basin, India, J. Geol. Soc. Ind. V. 18, No. 8, pp. 355-377.