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*Research Paper*

# Cretaceous Foraminiferal Assemblages in and Around Neykulam Village Tiruchirapalli District, Tamilnadu, India

**R. Soundar Rajan[1]*, R. Ramesh[2], R. Sivasamandy[3], R. Vijayan[2], S. Prabhu[2] and S. Dhiliban[2]**

**Corresponding Author: **R. Soundar Rajan** ✉ sraja.english@gmail.com*

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The Upper Cretaceous rocks of the south east coast of the peninsula form one of the most interesting formation of south India have been studied in detail by geologists. They are the relict of the great marine transgression during the Cenomanian period. The cretaceous sediments of Cauvery basin in south India have been studied and, the cretaceous foraminiferal research on early in the exploration of hydrocarbons in the basin. The microfossils preserved in these outcrops and three small inliers of these Cretaceous rocks occur among the younger Tertiary and post Tertiary formations which cover the east coast of this great peninsular.

***Keywords:*** Upper Cretaceous- Benthic-Planktonic Foraminifera

## Introduction

The present study area deals with assemblage of some benthic and planktonic foraminifera in and around Neykulam village, Tiruchirappalli district, Tamilnadu The study area is located within the toposheet number 58/4, between 78°50'23"E 11°30'24"N.It is about 5km SW of Karai village, North of Maruvattur and the East of Ariyalur town. It is a part of Uttatur formations characterized with gypsiferrous clay and makes soft. Foraminifers are comparatively large differing rom all other Protozoa. They are adapted to all aquatic most live in marine waters, but some can exit in salt lakes or brackish water. It has been stated that about 30,000 species of living and fossil Foraminifera have been described, and some investigators believe that many additional thousands of species are yet unknown. Although Pre-Cambrian foraminifera have been reported, they have been generally discredited. Some of the important works includes those of Sundaram, R. and Rao, P.S. (1966),Rasheed and Govidan (1968), Blanford, H.F. (1862), Chidambaram, L., (1989), Govindan, A., (1977), Govindan, A., (1978), Govindan, A., et al (1995), Govindan, A., et al (1998), Nagendra, R., and Jaiprakash, B.

1 CSIR-National Geophysical Research Institute, Hyderabad -500 007, India.
2 National College, Tiruchirappalli- 620 001, India.
3 PRIST (Deemed to be University), Thanjavur-613403, India.

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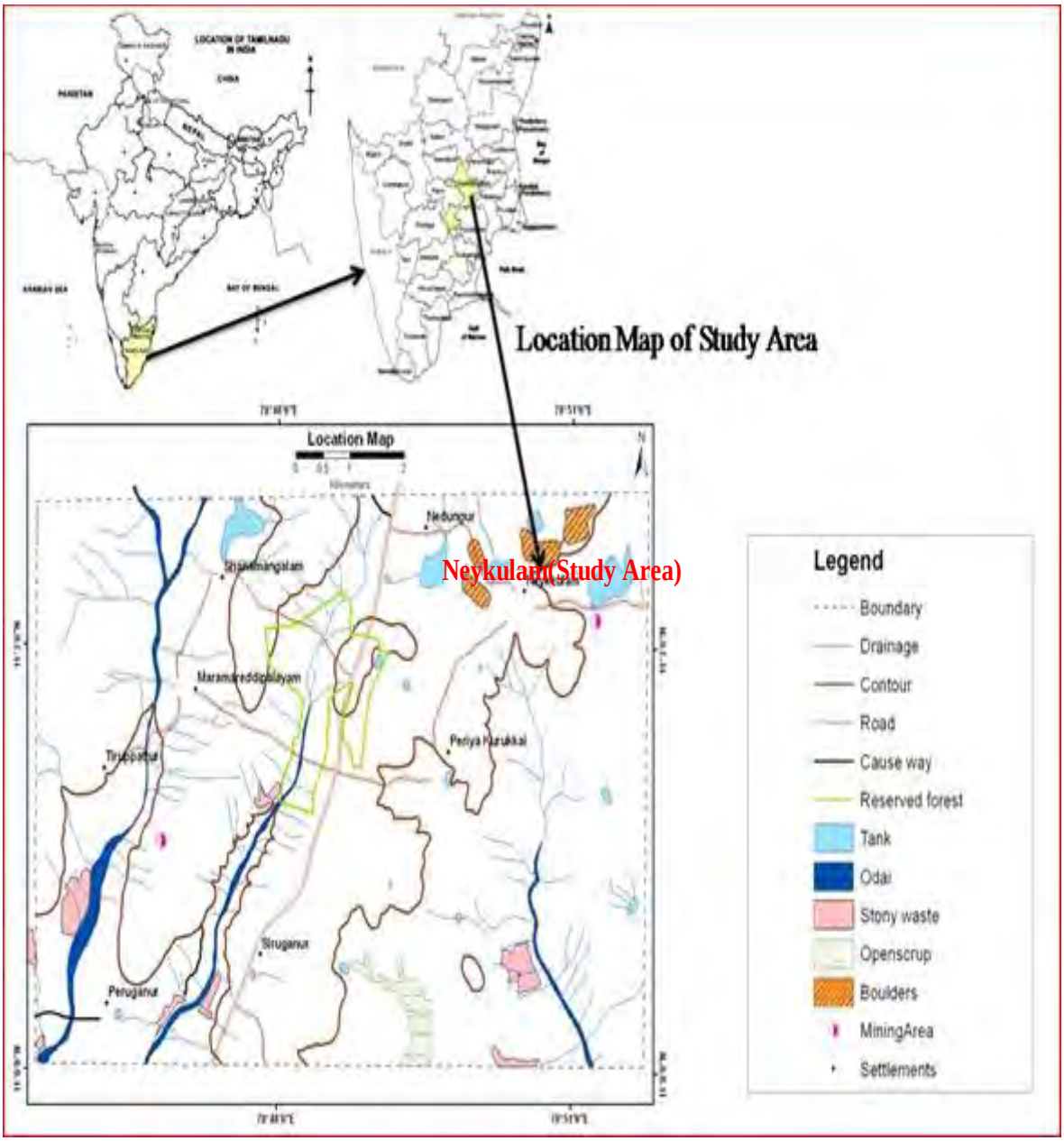
## STUDY AREA MAP

## Materials and Methods

Shallow boreholes in the outcropping sediments of the basin were drilled in the early 1960's followed subsequently by drilling of deep exploratory wells because of geological and

**Figure 1: Location of the Study Area**



seismic inputs in different parts of the basin. This study has considerably helped in understanding the subsurface stratigraphy of the basin. In the present study foraminiferal data generated from outcropping section to bring out a composite planktonic foraminiferal zonation that can be applied in the surface sequences for correlation. Spatial distribution of cretaceous planktonic zones in the field in Tiruchirappalli area has been indicated firmly to the different lithounits in the stratigraphic column.

## Stratigraphy

Detailed geological mapping was carried out by various, drilling number of boreholes and extensive micropalaeontological and sedimentological studies give a clear picture of the stratigraphy of Tiruchirappalli area fig-1. Kaolinite- Smectite dominant Therani bed lies unconformably over the Archeans (Charnockite/ Gneiss). The Uttatur group lies unconformably over these Gondwana beds, comprising basal conglomerates, grey shale (Subbaraman, 1968), algalcoralline limestone and Karai shale. Maravathur clay grouped in the Uttatur is identified as a facies variation of Karai shale in this study. The group could be divided into two units based on the Belemnite occurrences. The lower one is rich in Belemnite and the upper is devoid of it, and the unconformity between the Uttatur group and Paravey formation, Tiruchirappalli group is well documented and it is of small duration. The Paravey formation comprises of calcareous sandstone, argillaceous limestone and limestone. It is overlained unconformable on the Garudamangalam formation which consist of ferruginous sandstone, grey shale, and limestone and in turn is followed by current bedded sandstone.

The formation dips at a low angle and are irregular and form a few degree to as much as 25º towards the east or south east, the average being about 10º. Thickness of the Uttatur formation should however be more than 300 m allowed for by Blanford 1862 and probably around 600 m. It is noteworthy that though there are some cultivation in parts of the area occupied by this formation, where it's covered by soil. There are no villages near because the subsoil water is saline.

## Laboratory Works

Microfossil must be carefully collected, separated and preserved because of their smaller size and fragile nature. Microfossils are calcareous,or arenaceous in their composition. Usually they are abundant in limestone however they are common in shale, sandstone and siltstone. In study area microfossils are found to occur in limestone and gypsiferrous clays. Samples weighing 2kg are collected in polythene bag from 10 locations. Utmost care was taken to make the sample a representative. These samples are thoroughly washed in water and in hydrogen peroxide. About 200 grams of the sample was taken in a china dish and properly numbered, 5 grams of n $Na_2CO_3$ was added to the sample and after mild boiling for 30 minutes, was given a through wash with water. Then the sample was soaked with 25 ml of $H_20_2$ and kept undisturbed for 24 hours. Again the sample was heated and washed with water. The sample was then kept in oven for thorough drying and sieved in different fractions. Each retains are collected and kept in small covers for further study. Separation of microfossils from the selected are carried out using binocular microscope with an objective power of 10X lens. Microfossils thus picked up are placed in slide and numbered. Micro photos

using pentex camera was taken and labelled. The micro-photos of selected species are presented in plates.

## Foraminiferal Distribution

### *Lenticulina nuda (Reuss) 1862 (Plate-1 Figures 1 and 2)*

**Description:** The test is free, planispiral, involute and subovate in outline. Chambers are 7 to 10 in number subtriangular and gradually increasing in size, particularly in height near the periphery. Sutures are arcuate and gently depressed. Periphery is acute, wall is calcareous, perforate and smooth. Aperture is terminal, radiate at the apex of the narrow elongate subtriangular apertural face.

**Remarks:** The subovate outline, planispiral coiling, gradually increasing chambers are the distinguishing character of this species. The absence of universal stage distinguishes this species from closely allied specimen of Saracenaria. The species seem to have a long stratigraphic range as it has been reported both from Early to late Cretaceous beds. It is commonly reported from the Early Cretaceous sediments in the Tiruchirappalli.

| | | |
|---|---|---|
| Super family | : | NODOSARIACEA (Ehrenberg, 1839) |
| Family | : | NODOSARIDAE, (Ehrenberg, 1839) |
| Sub Family | : | NODOSARINAE, (Ehrenberg, 1839) |
| Genus | : | Lenticulina lamark (1804) |
| Name | : | lenticulina nuda (Reuss) 1862 |

### *Lenticulina Secans (Reuss) (Plate-1 Figures 3 and 4)*

**Description:** The planispiral test is subcircular and moderately large in size. The test is having 6 to 8 sub arcuate chambers in the final whorl. The chambers are sub triangular and moderately increasing in size. The sutures are limbate, arcuate and gently raised. The periphery is acutely rounded with a transparent keel. The aperture is radiate at the apex of the aperture face. Wall is calcareous and smooth.

**Remarks:** Raised sutures, keeled periphery and weakly to well developed umbos at the centre are the distinguishing character of this species. The species is widely reported from the Early Cretaceous sediments in particular from Albian sediments in Tiruchirapalli Cretaceous.

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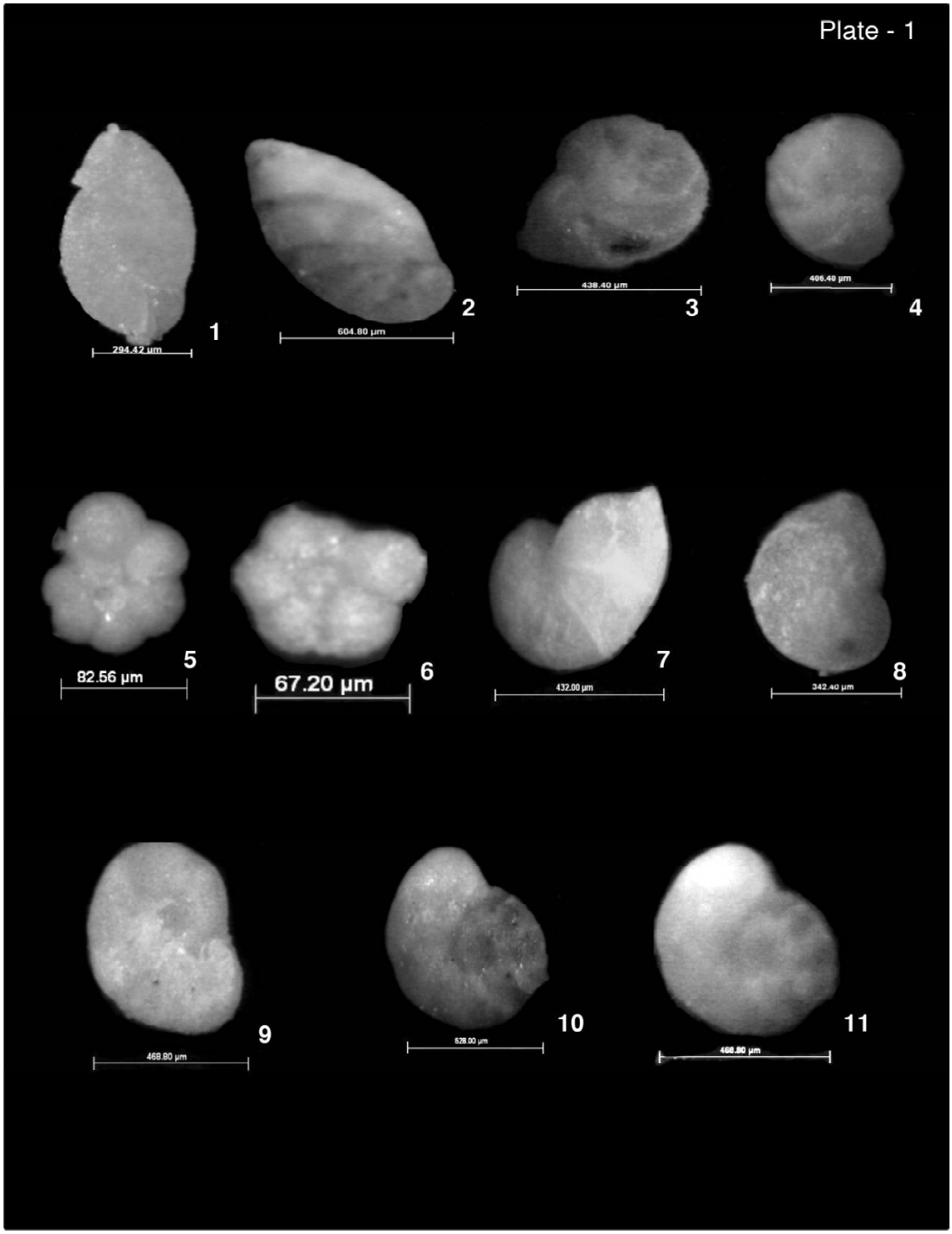
|---|---|---|
| Super family | : | NODOSARIACEA (Ehrenberg, 1839) |
| Family | : | NODOSARIDAE, (Ehrenberg, 1839) |
| Sub Family | : | NODOSARINAE, (Ehrenberg, 1839) |
| Genus | : | Lenticulina lamark (1804) |
| Name | : | lenticulina secans (Reuss) 1862 |

### *Hedbergella planispira (Plate 1 Figures 5 and 6)*

**Description:** The test is free, small, low trochospiral, spiral and umbilical sides nearly flat giving raise to planispiral appearance. Chamber 6- 7 in the final whorl, sub globular and gradually increasing in size. Sutures distinct, nearly radian and depressed, wall is calcareous, perforate, smooth to finely hispid. Umbilicus is moderately

**Figure 2: The Cretaceous Sediments Fossils from Neykulam, Ariyalur District; (Courtesy Ehrenberg (1838), Ramanathan (1982), Bartenstein and Bolli (1986), Sigal (1958), Cushman (1927)**




**Note:** 1-2, lenticulina nuda; 3-4, Lenticulina secans; 5-6, Hedbergella planispira; 7-8, Saracenaria frankei; 9, 10-1, Anomalina intermedia.

deep wide. Aperture is a low arch, interior marginal, umbilical to extra umblical with a small incipient flap. Periphery is broadly rounded and lobulate.

**Remarks:** Six to seven gradually increasing chamber, nearly radial sutures, smooth finely hispid wall, planispiral appearance and broadly rounded periphery distinguishes this from other species. Some juvenile specimens with five rapidly increasing chambers are closely similar to *Hedbergella delrioensis* Carsey. *H. planispira* was originally described from Grayson Formation of Northern Texas, by (Tappan, 1940). Since then this species has been reported widely from Albian and younger Cretaceous sediments. It is commonly reported in the Early Cretaceous Albian sediments in the Trichinopoly Cretaceous. This is easily identifiable planktonic species and seems to have wide stratigraphic range in the planktonic zonal scheme, *Hedbergella planispira* Zone has been positioned at the base of Albian

| | | |
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| Family | : | ROTALIPORIDAE, Sigal, 1958 |
| Genus | : | Hedbergella Bronnimann and Brown, 1958 |
| Name | : | Hedbergella planispira Tappan, 1940 |

*Saracenaria frankei* Dam (Plate 1, Figures 7 and 8)

**Description:** Test free, initially planispirally coiled later tending to uncoil, triangular in transverse section. Periphery margin is acute. Chambers elongated, curved, moderately increasing in size. Sutures distinct flush with the surface, outer periphery is arcuate and acute and the inner periphery is elongate and broadly truncate and sloping down at the apertural end. Sutures gently curved and flush with the surface. Aperture is radiate at the apex of the apertural face at the inter junction of the outer periphery and apertural face. The calcareous wall is perforate and smooth.

**Remarks:** The arcuate periphery sloping apertural face and elongate test are the distinguishing characters for the species. This widely reported from Early Cretaceous. It has been recorded in the Early Cretaceous Trichinopoly sediments.

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|---|---|---|
| Super family | : | NODOSARIACEA (Ehrenberg, 1839) |
| Family | : | NODOSARIDAE, (Ehrenberg, 1839) |
| Sub Family | : | NODOSARINAE, (Ehrenberg, 1839) |
| Genus | : | Saracenaria defrance (1822) |
| Name | : | Saracenaria |

Anomalina intermedia (Plate 1, Figures 9, 10 and 11)

**Description:** The test is free, sub circular, nearly biconvex and low trochospiral. The umbilicus is narrow and deep, partly covered by flap. Chambers 9 to 10, gradually increasing in the final whorl. Suture gently arcuate, nearly flush with the surface initially but later gently depressed. The periphery is broadly rounded and lobulate in the adult at the end. Wall calcareous bilamellar. Aperture is a low interior marginal slit extending from near the periphery to the umbilicus.

**Remarks:** This species is widely reported from the Early Cretaceous in Europe. It's commonly reported from Albin sediments in the Trichinopoly Cretaceous. It's commonly seen along with Hedbergella planisipral in the studied area.

| | | |
|---|---|---|
| Family | : | ANOMALINADAE, |
| Genus | : | Gavelinella brotzen, 1942 |
| Species | : | Anomalina intermedia Berthelin 1880 |

## Summary and Conclusion

An integrated attempt on the study of foraminieral occurrences has been carried out in the Neykulam village, approximately 5 km NE of Karai village is selected for the present study. Sample representing the micro fossiliferous clay and sandstones have been collected from the outcrops. The samples are treated in the laboratory for separation of microfossils from the samples are picked up, mounted and properly indexed. Using a binocular microsope, the fossils have been studied, identified for their systematic palaeontology. Photo-micrographs were taken and presented in representive plates. Benthic foraminifers are abundantly populated in the gypsiferrous clays and sandy formations of Neikulam village. About 3 species, representing 3 families of foraminifera have been identified and reported systematically. These benthic forms are both calcareous and arenaceous agglutinated forms. From the reference, its evidenced that these forams are of Early Albian to Middle Albian in their age.

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