



Turonian Foraminifers from the Karai Shale, Uttattur Group, Southern India

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Abstract

A study was conducted to study the foraminiferal assemblage, diversity of the benthic foraminifers and to interpret the age of the sediments from the Karai Shale, Uttattur Group, Southern India. Two hundred and ten samples were taken from the study area for the present study. Seventy eight species of foraminifera were identified of which sixty three are benthic foraminifera and fifteen are planktic foraminifera. The assemblage was dominated by the species of *Lenticulina*, which was present abundantly almost in all the samples followed by the assemblages of the species *Gyroidinoides*, *Dentalina*, *Gavelinella*, *Nodosaria*, *Frondicularia*, *Vaginulina*, *Marginulina* and *Quadrimorphina* which were present commonly in all the samples. The presence of planktic foraminifera *Whiteinella archaeocretacea*, *Whiteinella baltica*, *Whiteinella brittonensis*, *Helvetoglobotruncana helvetica* and *Marginotruncana sigali* indicates Turonian age for the samples.

1. Introduction

Foraminifera are unicellular animals ranging in size from 0.01mm to 1mm in their longest dimension. Most of them are exclusively marine organisms. The Foraminifera represent one of the most important groups of marine protists. Cretaceous is the longest period of the Mesozoic era. The boundary between the Mesozoic and Cenozoic era is defined at the end of Cretaceous period. The Cretaceous is largely marine in most places though a continental facies of the Lower Cretaceous with plant fossils and reptiles, fishes etc. is also found in some regions, especially in Gondwanaland (Nalli Srujana and Narigesu kumar swamy, 2014). The marine Cretaceous Formations are developed both in Peninsular and extra-peninsular regions. The marine Cretaceous sedimentary sequences in the Indian Peninsula are best developed in the Cauvery Basin, ranging in age from Hauterivian to Maastrichtian (Venkatachalapathy et al. 2014).

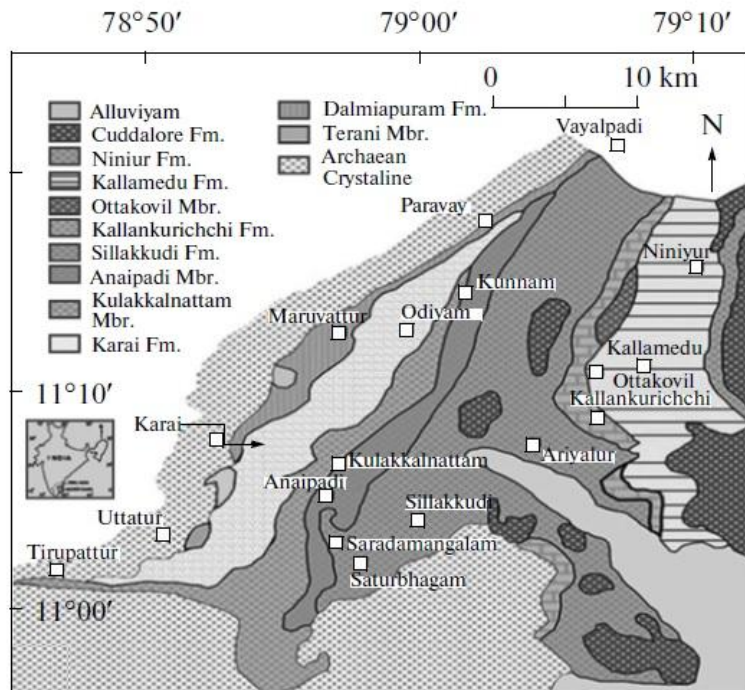


Figure 1. Geological Map of Ariyalur area, Cauvery basin (Nagendra et al., 2013)

2. Study Area

In the Cauvery basin, the Cretaceous rocks are exposed in five detached outcrop patches namely, Sivaganga, Thanjavur, Ariyalur, Vriddachalam and Puducherry basins from south to north (Venkatachalapathy et al. 2014). The Ariyalur outcrop is the largest among the five outcrops. The Cretaceous rocks of the Ariyalur area have been classified into three Groups viz. Uttattur, Trichinopoly and Ariyalur Groups in the ascending order and they include many Formations. The Karai Formation of the Uttattur Group is well exposed as badland developed in an easterly draining catchment to the east of Karai (Sundaram et al., 2001). The study area falls within North Latitudes $11^{\circ} 06'$ to $11^{\circ} 07'$ and East Longitudes $78^{\circ} 53'$ to $78^{\circ} 56'$ forming part of the toposheet number 58 I/16 of Geological Survey of India.

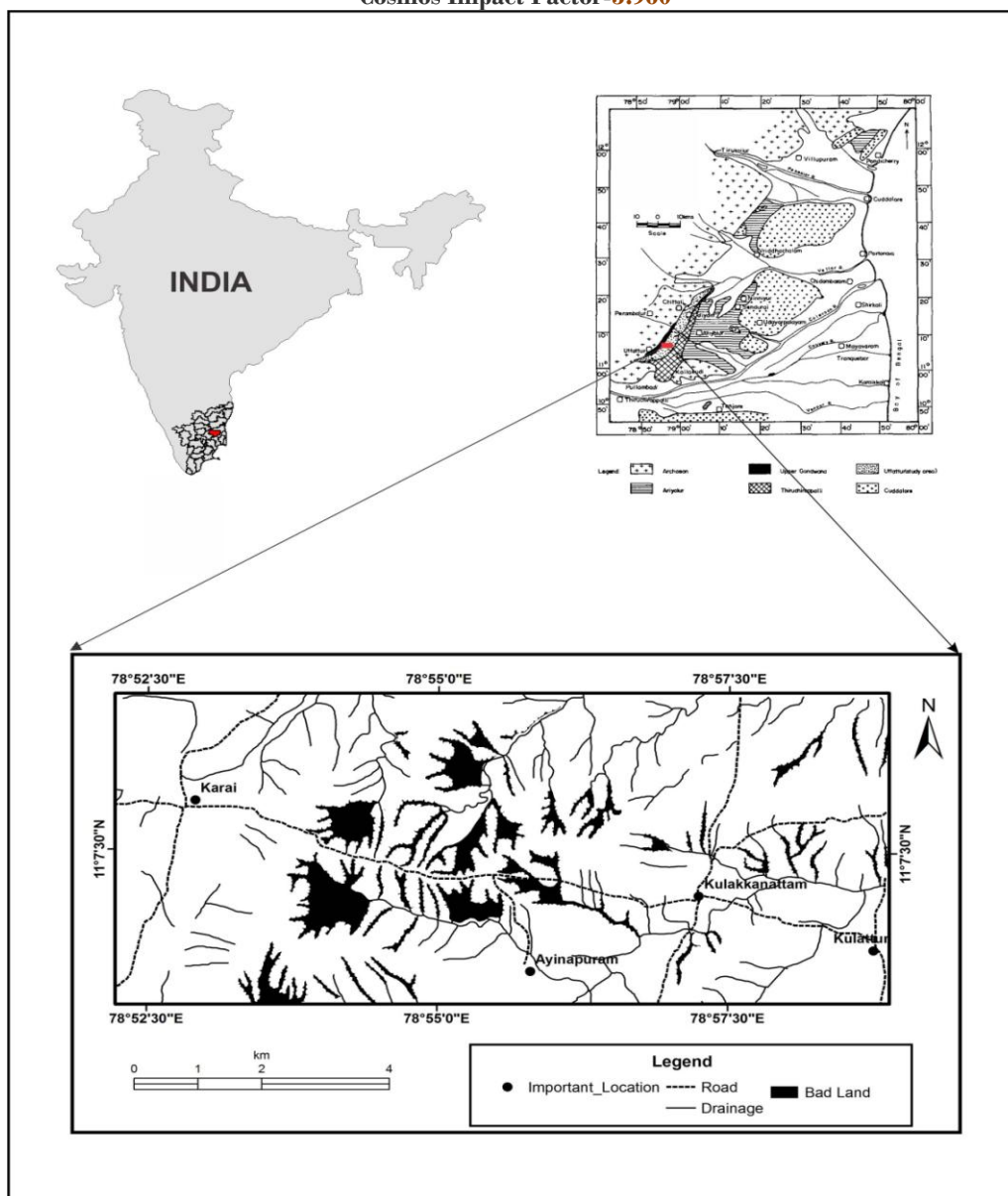


Figure 2. Location map of the study area

3. Materials and methodology

Two hundred and ten (210) surface sediment samples were collected from the study area. The samples were packed in zip lock covers and were labelled in the field itself. In the micropaleontological lab, 50 grams of each sample were taken for processing. Depending on the hardness of the sample, different reagents viz. water, hydrogen peroxide, sodium carbonate (anhydrous), etc., were used for disintegration. The samples were soaked for about 12-24 hours in the reagents and are then heated depending on the requirement. The disintegrated samples were then washed with running water in ASTM 230 sieve mesh and were transferred to a china bowl. The transferred remains are then dried in a hot air oven. The dried samples are passed through a series of ASTM mesh to get different size fractions for hassle free view under



microscope. The foraminifera obtained were placed in a 24 square chambered micropaleontological slides for further identification.

4. Results

The processed samples have yielded seventy eight species of foraminifera of which sixty three are benthic foraminifera and fifteen are planktic foraminifera. The classification proposed by A.R.Loeblich Jr. and H.Tappan (Foraminiferal genera and their classification – Published by Van Nostrand Reinhold Company, New York-1988) is followed in the present study. Works from various Cretaceous workers were used for the specific identification of the species (Venkatachalapathy, 1993; Rasheed and Govindan, 1968; Rasheed, 1962, 1962b).

4.1 Foraminiferal Assemblage

The identified benthic and planktic foraminiferal species are as follows

Benthic foraminifera: *Ammobaculites torosus*, *Ammodiscus cretaceus*, *Ammodiscus planus*, *Anomalinoidea indica*, *Astacolus complanatus*, *Astacolus jarvisi*, *Dentalina basiplanata*, *Dentalina catenula*, *Dentalina cylindroides*, *Dentalina marginuloides*, *Dentalina xiphioides*, *Frondicularia acilis*, *Frondicularia filocincta*, *Frondicularia mucronata*, *Frondicularia pattiensis*, *Frondicularia striatula*, *Gaudryina tailleuri*, *Gavelinella baltica*, *Gavelinella cenomanica*, *Gavelinella intermedia*, *Gavelinella rudis*, *Gavelinella simionescui*, *Globulina lacrima*, *Globulina prisca*, *Glomospirella gaultina*, *Gyroidinoidea depressa*, *Gyroidinoidea globosa*, *Gyroidinoidea nitidus*, *Lagena globosa*, *Lagena sulcata*, *Lenticulina circumcidanea*, *Lenticulina gaultina*, *Lenticulina navarroensis*, *Lenticulina nodosa*, *Lenticulina ovalis*, *Lenticulina polygona*, *Lenticulina rotulata*, *Lenticulina saxoretacea*, *Lenticulina secans*, *Lenticulina stephensoni*, *Lingulogavelinella globosa*, *Marginulina bullata*, *Marginulina glabra*, *Marginulina hamuloides*, *Marginulina linearis*, *Marginulina munieri*, *Marginulina troedssoni*, *Nodosaria distans*, *Nodosaria obscura*, *Nodosaria orthopleura*, *Oolina simplex*, *Quadrinormina allomorphinoides*, *Quadrinormina camerata*, *Quinqueloculina antiqua angusta*, *Ramulina aculeata*, *Ramulina globulifera*, *Ramulina spandeli*, *Saracenaria triangularis*, *Tappanina rasheedii*, *Vaginulina debilis*, *Vaginulina kochii*, *Vaginulina plummerae* and *Verneulinoides chapmani*.

Planktic foraminifera: *Globigerinelloidea caseyi*, *Hedbergella delrioensis*, *Hedbergella planispira*, *Helvetoglobotruncana helvetica*, *Heterohelix globulosa*, *Heterohelix moremani*, *Heterohelix pulchra*, *Marginotruncana difformis*, *Marginotruncana indica*, *Marginotruncana renzi*, *Marginotruncana sigali*, *Praeglobotruncana stephani*, *Whiteinella archaeocretacea*, *Whiteinella baltica* and *Whiteinella brittonensis*.

5. Discussion

5.1 Age

The age of the sediment samples were assigned based on the planktic foraminifers *Dicarinella difformis*, *Helvetoglobotruncana helvetica*, *Marginotruncana indica*, *Marginotruncana renzi* and *Marginotruncana sigali*.

Heterohelix globulosa, *Heterohelix moremani*, *Heterohelix pulchra*, *Hedbergella delrioensis*, *Hedbergella planispira*, *Heterohelix globulosa*, *Heterohelix moremani*, *Heterohelix pulchra*, *Marginotruncana difformis*, *Whiteinella archaeocretacea*, *Whiteinella baltica* and *Whiteinella brittonensis* are present in the samples 1 to 70. The presence of *Whiteinella archaeocretacea*,



Whiteinella baltica and *Whiteinella brittonensis* indicates Early Turonian age for the samples. In the samples 71 to 120, *Globigerinelloides caseyi*, *Hedbergella delrioensis*, *Hedbergella planispira*, *Helvetoglobotruncana helvetica*, *Heterohelix globulosa*, *Heterohelix moremani*, *Heterohelix pulchra*, *Marginotruncana difformis*, *Praeglobotruncana stephani*, *Whiteinella archaeocretacea*, *Whiteinella baltica* and *Whiteinella brittonensis* are present. The presence of *Helvetoglobotruncana helvetica* indicates Early to Middle Turonian for the samples. *Globigerinelloides caseyi*, *Hedbergella planispira*, *Heterohelix globulosa*, *Heterohelix pulchra*, *Marginotruncana difformis*, *Marginotruncana indica*, *Marginotruncana renzi*, *Marginotruncana sigali* and *Praeglobotruncana stephani* are present in the samples 121 to 210. The presence of *Marginotruncana sigali* indicates early Late Turonian for the samples.

5.2 Distribution of the benthic foraminifera

The benthic foraminiferal species of the genus *Lenticulina* is found abundantly almost in all the samples. Next to it, the species of the genus *Gyroidinoides*, *Dentalina*, *Gavelinella*, *Nodosaria*, *Fronidularia*, *Vaginulina*, *Marginulina* and *Quadriformina* are present in most of the samples. (Table 1)

Genus	Percentage	Genus	Percentage
<i>Ammobaculites</i>	0.50	<i>Lingulina</i>	0.30
<i>Ammodiscus</i>	0.54	<i>Lingulogavelinella</i>	1.83
<i>Anomalinoidea</i>	0.60	<i>Marginulina</i>	4.55
<i>Astacolus</i>	0.88	<i>Nodosaria</i>	6.55
<i>Dentalina</i>	7.18	<i>Oolina</i>	0.76
<i>Fronidularia</i>	5.64	<i>Pleurostomella</i>	1.34
<i>Gaudryina</i>	0.86	<i>Pseudonodosaria</i>	0.34
<i>Gavelinella</i>	6.99	<i>Quadriformina</i>	4.62
<i>Globulina</i>	1.80	<i>Quinqueloculina</i>	1.14
<i>Glomospirella</i>	0.83	<i>Ramulina</i>	1.89
<i>Gyroidinoides</i>	11.89	<i>Saracenaria</i>	0.88
<i>Haplophragmoides</i>	1.14	<i>Tappanina</i>	0.79
<i>Lagena</i>	2.01	<i>Vaginulina</i>	5.66
<i>Lenticulina</i>	27.89	<i>Verneulinoides</i>	0.62

Table 1. Percentage wise distribution of benthic foraminifera

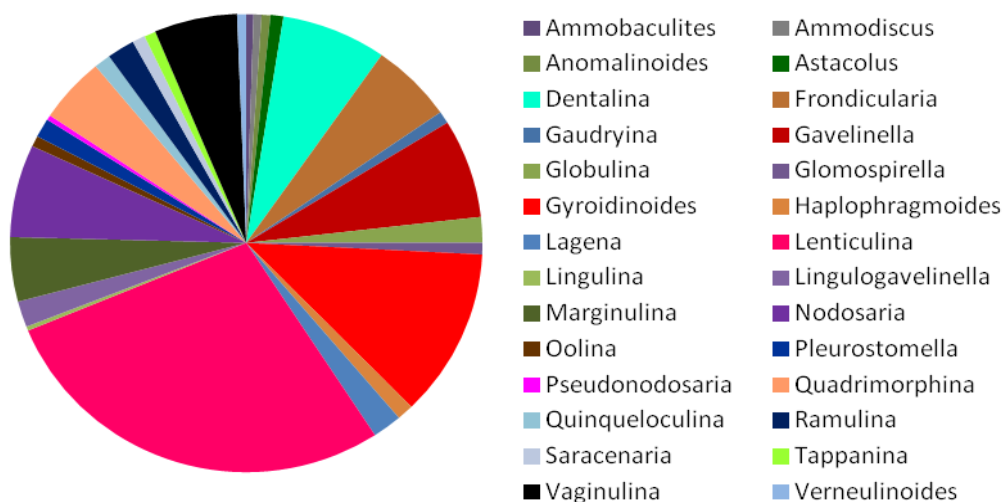


Figure 3. Pie diagram of Percentage wise distribution of benthic foraminifera

6. Summary and Conclusion

Two hundred and ten surface samples were collected systematically from the Karai shale for recording the foraminiferal assemblage. Well preserved benthic and planktic foraminifera were obtained. Sixty three benthic foraminifera and fifteen planktic foraminifera were recorded. Based on the occurrence of *Whiteinella archaeocretacea*, *Whiteinella baltica*, *Whiteinella brittonensis*, *Helvetoglobotruncana helvetica* and *Marginotruncana sigali* the age of the sediment samples were assigned as Turonian. *Lenticulina* were present abundantly almost in all the samples. Besides *Lenticulina*, the species of the genus *Gyroidinoides*, *Dentalina*, *Gavelinella*, *Nodosaria*, *Frondicularia*, *Vaginulina*, *Marginulina* and *Quadriformina* were present in most of the samples.

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