

# FOSSIL SPORES AND POLLEN FROM THE LOWER CRETACEOUS SUBSURFACE SEDIMENTS NEAR KARAİKAL, CAUVERY BASIN<sup>1,2,3</sup>

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## ABSTRACT

Lower Cretaceous (Neocomian — Aptian) age is assigned to sub-crop sediments overlying the Archaean crystalline basement near Karaikal in the Cauvery basin on the basis of Palynological studies.

The assemblage is closely comparable to the Lower Cretaceous assemblages from Kutch and Andhra Pradesh in India.

## INTRODUCTION

THE present paper deals with a detailed investigation of dispersed spores and pollen recovered from subsurface sediments overlying the Archaean crystalline basement near Karaikal in the Cauvery Basin.

Results of preliminary palynological investigations from these sediments were published by Banerjee and Misra (1966). They recorded an assemblage comprising of *Osmundacidites*, *Trilobosporites*, *Lygodiumsporites*, *Cicatricosisporites*, *Callialasporites* (= *Applanopsis*), *Alisporites*, *Podocarpidites*, *Abietinaepollenites*, *Microcachryidites*, *Aquilapollenites*, *Palmaepites*, *Nymphaeaceaeapites*, *Monocolpites* and *Tricolporites* and compared this assemblage with Middle-Upper Cretaceous assemblages of Australia, Canada and Western India and dated the sediments as belonging to Middle-Upper Cretaceous age (i.e. Cenomanian or post Cenomanian).

Among the fossils listed by them *Callialasporites* (= *Applanopsis*) which is an important zone fossil is known to occur in Jurassic — Lower Cretaceous sediments of Australia, India, Canada and other parts of the world (BALME, 1957 & 1964; DETTMANN, 1963; VENKATACHALA, 1967 & 1968; VENKATACHALA & KAR, 1968; POCKOCK, 1962). It is not recorded in post Albian sediments. *Aquilapollenites* which is also a very important zone fossil is only known

from the Upper Cretaceous sediments and is not recorded in Pre-Senonian sediments (BRATZEVA, 1967; ROUSE, 1957; SAMOILOVICH, 1967; SRIVASTAVA, 1966; STANLEY, 1961).

The present study is undertaken to re-evaluate the assemblage recovered from the Karaikal sediments. The material consisted of greyish black shales and was treated with Hydrofluoric acid (40%) for 17 hours followed by Nitric Acid (40%) for 6-8 hours and were cleared with Potassium Hydroxide (2.5%) for 5 minutes. Heavy liquid (Cadmium Iodide, Zinc Iodide and Potassium Iodide in the ratio of 1:1:2) of the specific gravity 2.3 was used for separation of heavy and lighter fractions of the macerates. The lighter fraction mainly contained spores and pollen. The slides were mounted with Polyvinyl Alcohol and Canada Balsam.

## PALYNOLOGICAL COMPOSITION

The following taxa are present:

Pteridophytic spores — *Cyathidites*, *Stereisporites*, *Biretisporites*, *Gleicheniidites*, *Concavisporites*, *Osmundacidites*, *Impardecispora*, *Neoraistrickia*, *Ceratosporites*, *Foveosporites*, *Lycopodiacidites*, *Lycopodiumsporites*, *Tripertina*, *Foveotriletes*, *Klukisporites*, *Staplinsporites*, *Polycingulatisporites*, *Cicatricosisporites*, *Trilobosporites*, *Matonisporites*, *Coronatispora*, *Sestrosporites*, *Cingulatisporites*, *Densoisporites*, *Contignisporites*, *Thymospora*, *Polypodiisporites*, *Appendicisporites* (= *Plicatella*).

Gymnospermous pollen — *Callialasporites* (= *Applanopsis*), *Podocarpidites*, *Alisporites*, *Vitreisporites*, *Microcachryidites*, *Podosporites*, *Ginkgocycadophytus*, *Cycadopites*, *Classopollis*, *Araucariacites*, *Spheripollenites*.

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Questionable Bryophytic Spores — *Cooksonites*, *Aequitriradites*.

The assemblage is dominated by schizeaceous and tree fern spores and *Callialasporites* a saccate *Gymnospermous* pollen. *Spheripollenites* an alete spherical spore is also abundant in the assemblage. The assemblage can be distinguished by the presence of:

*Aequitriradites*, *Cooksonites*, *Spheripollenites*, *Classopollis*, *Podosporites* and *Microcachryidites*, *Callialasporites* (= *Applanopsis*), *Contignisporites*, *Sestrosporites*, *Coronatispora*, *Polycingulatisporites*, *Staplinisporites*, *Foveotriletes*, *Tripartina*, *Neoraistrickia* and *Ceratosporites*.

#### PALYNOLOGICAL COMPARISON

Jurassic — Lower Cretaceous (Upper Gondwana) Palynological assemblages are known from Rajmahal hills (SAH & JAIN, 1965; RAO, 1943; VISHNUMITRE, 1954); Rajasthan and Saurashtra (SRIVASTAVA, 1965; VARMA & RAWAT, 1964); Kutch (SINGH, SRIVASTAVA & ROY, 1964; VENKATACHALA, 1967, 1968; VENKATACHALA, KAR & RAZA, 1969; VENKATACHALA, 1969); Jabalpur, M.P. (DEV, 1961; SINGH, 1966) and East Coast Gondwanas (RAMANUJAM, 1957).

Lower Jurassic assemblage is also known from Salt range, Pakistan (SAH & JAIN, 1967). The Salt Range assemblage is characterized by the presence of *Staplinisporites*, *Tigrisporites*, *Ischyosporites*, *Divisisporites*, *Cosmosporites*, *Classopollis*, *Gliscopollis*, ?*Eucommiidites*, *Spheripollenites*, besides some megaspore genera. The salt range assemblage is the oldest Jurassic assemblage known so far, and is comparable to the Leigh Creek Coal measure assemblage described by Palyford and Dettmann (1965) which is dated as Rhaetic — Liassic by them. *Tigrisporites*, *Cosmosporites*, *Gliscopollis* and ?*Eucommiidites* are restricted to Upper Triassic and Liassic sediments. The only common spore genera are *Staplinisporites*, *Ischyosporites*, *Classopollis* and *Spheripollenites*, and thus this assemblage is not comparable to the Karaikal assemblage.

The Rajmahal assemblage described by Sah and Jain (*l.c.*) is Upper Jurassic in age and is distinguished by the presence of *Gleicheniidites*, *Foraminisporis*, *Applanopsis*, *Trisaccites*, *Podosporites*, *Phyllocladidites* and *Dacrycarpites*. The absence of *Aequitriradites*, *Coronatispora*, *Sestrosporites*, *Cooksonites* and others in the Rajmahal assem-

blage differentiates this assemblage from the Karaikal one. The Lathi (Middle Jurassic) assemblage described by Srivastava (*l.c.*) also is not comparable.

In a recent study Venkatachala and Kar (in press) have demarcated the Katrol-Bhuj boundary on the basis of presence and absence of important Jurassic — Cretaceous index fossils. *Katrolaites* and *Exesipollenites* in association with *Cyathidites*, *Concavissimisporites*, *Contignisporites*, *Callialasporites* and *Podocarpidites* is considered by them as distinguishing the Katrol sediments. The Bhuj sediments are distinguished by the presence of *Callialasporites*, *Ischyosporites*, *Murospora*, *Aequitriradites*, *Schizosporis*, *Appendicisporites*, *Neoraistrickia*, *Ceratosporites*, *Staplinisporites*, *Polycingulatisporites*, *Sestrosporites*, *Coronatispora*, *Coptospora*, *Cooksonites*, *Contignisporites* and *Microcachryidites*. The Karaikal assemblage is closely comparable to the Bhuj assemblage described by Venkatachala *et al.* (*l.c.*) and Singh *et al.* (*l.c.*). The index fossils of Bhuj are also present in the Karaikal sediments.

The Dhrangadhra assemblage described by Varma and Rawat (1964) is distinctly Lower Cretaceous and is distinguished by the following fossil genera:

*Foveotriletes*, *Neoraistrickia*, *Ceratosporites*, *Appendicisporites* (= *Plicatella*), *Klukisporites*, *Lycopodiumsporites*, *Contignisporites*, *Cooksonites*, *Aequitriradites*, *Kraeuselisporites*, *Staplinisporites*, *Polycingulatisporites*, *Classopollis*, *Callialasporites* (= *Applanopsis*), *Microcachryidites*, *Podocarpidites*, *Alisporites*.

All the genera listed above are important Lower Cretaceous index genera (the list is compiled from a re-study of the original material by Venkatachala and Rawat) and are common to both Dhrangadhra and Karaikal sediments.

The Jabalpur assemblage studied by Dev (1961) and Singh (1966) is also closely comparable to the Karaikal one. The Vemavaram assemblage described by Ramanujam (1957) is not well documented and hence not compared here.

The *Microcachryidites* assemblage described by Balme (1964) and the *Stylosus-Speciosus* assemblage by Dettmann (1963) from Australian Mesozoic sediments are also closely comparable. Both the assemblages are from Neocomian — Aptian sediments.

Lower Cretaceous palynological assemblages recovered from subcrop sediments of Andhra Pradesh (VENKATACHALA, LUKOSE &

SHARMA, in press) are closely comparable to the Karaikal assemblage.

*Spheripollenites*, *Ceratosporites*, *Klukisporites*, *Aequitri-radites*, *Contignisporites*, *Coronatispora*, *Sestrosporites*, *Cooksonites*, *Polycingulatisporites*, *Staphlinisporites*, *Appendicisporites* (*Plicatella*), *Callialasporites* (= *Applanopsis*), *Microcachrydites*, *Classopollis* which are considered as typical of Lower Cretaceous sediments are common to both the Andhra Pradesh subsurface sediments and Karaikal sediments. These fossils are also present in the Bhuj as well as Australian Lower Cretaceous sediments (VENKATACHALA & KAR, *l.c.*; DETTMANN, *l.c.*; BALME, *l.c.*).

The presence of the above listed spore genera and the absence of *Katrolaites*, *Exesipollenites* and certain species of *Calliala-*

*sporites* (= *Applanopsis*) precludes a Jurassic age and the notable absence of Angiospermous pollen and the dominance of *Callialasporites* in association with *Aequitri-radites*, *Cooksonites*, *Coronatispora*, *Sestrosporites*, *Plicatella*, *Microcachrydites* and *Classopollis* restricts the age of the Karaikal sediments to Lower Cretaceous (Neocomian-Aptian).

The presence of *Aquilapollenites*, *Palmaepites*, *Nymphaeaceaeapites*, *Monocolpites* and *Tricolporites* reported by Banerjee and Misra (1966) are not confirmed in this study.

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