

PALYNOLOGY OF MESOZOIC SEDIMENTS OF KUTCH,
WEST INDIA. 8. A CHECK-LIST OF PALYNOLOGICAL
FOSSILS FROM CHAWAD RIVER AREA AND REMARKS ON
ASTERISPORITES GEN. NOV.

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ABSTRACT

Palynological fossils from Chawad river area, Kutch, are listed. The sediments are assigned a Upper Jurassic-Lower Cretaceous (Portlandian-Neocomian) age.

Asterisporites gen. nov. is proposed to accommodate trilete spore with an interradial ornamentation consisting of radiating sculpture around a circular depression. *A. stellatus* is designated as the type species.

INTRODUCTION

TRILETE spores designated here as *Asterisporites* is a part of a well-preserved assemblage recovered from grey shales collected from the Chawad river area (23°30'52"-23°25'11" to 69°14'29"-69°10'16") in Kutch by Shri P. V. Rao and N. A. Prabhu, Geologists of the Oil & Natural Gas Commission while mapping the west central part of Kutch District, Gujarat State, during 1962-63. The spores are common in most of the samples studied and are easily recognizable due to the significant ornamentation.

The material was mostly digested using Hydrofluoric acid (40%) followed by a treatment with Nitric acid and Potassium chlorate for a week. The residue was washed with Potassium hydroxide solution (2-3%) and the slides mounted in Polyvenyl alcohol and Canada balsam.

PALYNOLOGICAL ASSEMBLAGE

The assemblage consists of the following taxa:

- Cyathidites australis* Couper
- C. asper* (Bolikhovitina) Dettmann
- C. minor* Couper
- C. punctatus* (Delcourt & Sprumont) Delcourt, Dettmann & Hughes
- C. spp.*
- Stereisporites antiquasporites* (Wilson & Webster) Dettmann
- Auritulinasporites* sp.

- Leptolepidites major* Couper
- Concavissimisporites crassatus* (Delcourt & Sprumont) Delcourt, Dettmann & Hughes
- Asterisporites* Gen. nov.
- A. chlonovae* (Doering) comb. nov.
- Osmundacidites* cf. *O. Wellmanii* Couper
- O. sp.*
- Baculatisporites comaumensis* (Cookson) Potonié
- Neoraistrickia* sp.
- Ceratosporites* sp.
- Pilosisporites* sp.
- Foveotriletes kutchensis* Venkatachala
- Lycopodiumsporites eminulus* Dettmann
- L. sp.*
- Klukisporites scaberis* (Cookson & Dettmann) Dettmann
- Januasporites spinulosus* Dettmann
- Staplivisporites caminus* (Balme) Pocock
- Cicatricosisporites australiensis* (Cookson) Potonié
- C. hughesi* Dettmann
- C. ludbrookii* Dettmann
- C. pseudotripartitus* (Bolikhovitina) Dettmann
- Bhujiasporites hirsutus* Venkatachala et al
- Impardécispora apiveerrucatus* (Couper) Venkatachala et al.
- I. horridus* (Pocock) Venkatachala et al.
- I. indica* Venkatachala
- I. trireticulosa* (Cookson & Dettmann) Venkatachala et al.
- I. uralensis* (Bolikhovitina) Venkatachala et al.
- I. sp.*
- Trilites* sp.
- Ischyosporites punctatus* Cookson & Dettmann
- Matonisporites* sp.
- Boseisporites insignitus* Venkatachala
- B. sp.*
- Gleicheniidites* sp.
- Ornamentifera* sp.
- Plicifera* sp.

Sestrosporites pseudoalveolatus (Couper) Dettmann

Coronatispora perforata Dettmann

Contignisporites cooksonii (Balme) Dettmann

C. glebulentus Dettmann

C. multimuratus Dettmann

Densoisporites velatus (Weyland & Krieger) Krasnova

Cingulatisporites sp.

Polycingulatisporites reduncus (Bolkhovitina) Venkatachala *et al.*

P. sp.

Cooksonites cf. *C. variabilis* Pocock

Aequitriradites verrucosus (Cookson & Dettmann) Cookson & Dettmann

A. sp.

Polypodiisporites sp.

Callialasporites dampieri (Balme) Dev

C. trilobatus (Balme) Dev

C. segmentatus (Balme) Dev

C. triletus Singh *et al.*

C. cf. *C. monoalaspurus* Dev

Alisporites grandis (Cookson) Dettmann

A. sp.

Podocarpidites multisimus (Bolkhovitina) Pocock

P. minisulcus Singh

P. sp.

Vitreisporites pallidus (Reissinger) Nilsson

V. sp.

Microcachryidites antarcticus Cookson

Podosporites tripakshi Rao

Cycadophites sp.

Ephedripites sp.

Araucariacites australis Cookson

Spheripollenites sp.

Classopollis torosus (Reissinger) Couper

Gliscopollis sp.

Psilospora lata Venkatachala & Kar

Hystrichosphaeridium sp.

Deflandrea sp.

The Chawad river assemblage is closely comparable to the assemblage designated as zone II, considered as transitional from Katrol to Bhuj sediments in Kutch (Venkatachala & Kar, 1969). This assemblage is characterized by the presence of *Ceratospores*, *Foveotriletes*, *Klukisporites*, *Januasporites*, *Bhujasporites*, *Matonisporites*, *Boseisporites*, *Sestrosporites*, *Coronatispora*, *Cingulatisporites*, *Ischyosporites*, *Staplinsporites*, *Polycingulatisporites*, *Cooksonites*, *Aequitriradites*, *Callialasporites*, *Podocarpidites*, *Araucariacites*, *Spheripollenites*, *Classopollis*, *Gliscopollis*, *Asterisporites* and *Psilospora*.

Asterisporites, *Spheripollenites* and *Januasporites* are not earlier known from Kutch.

An Upper most Jurassic-Lower Cretaceous (Portlandian-Neocomian) age is assignable on the basis of the above mentioned palynological assemblage.

An abundance of schizaeaceous spores assigned here to *Cicatricosisporites*, *Contignisporites*, *Pilosisporites*, *Trilobosporites*, *Trilites*, *Concavissimisporites*, and *Classopollis* — *Gliscopollis* group of operculate pollen referable to Cheirolepidaceae in association with *Hystrichosphaeridium* sp. and *Deflandrea* sp. (not encountered in 500 counts, only 3 specimens recorded in 40 slides) suggest that the sediments were deposited in an inland swamp away from the shore line predominantly in fresh water conditions.

A detailed account of the taxonomy, comparison of the assemblage and field data are planned for a later date.

SYSTEMATIC DESCRIPTION

Asterisporites Gen. nov.

Synonym

1957 — Spore designate W₁₁ of uncertain affinity, Rouse

1960 — *Stenozonotriletes (stellatus)* Chlonova

1962 — *Stenozonotriletes (radiatus)* Chlonova

1966 — *Taurosusporites (chlonovae)* Doering

1966 — *Taurosusporites (radiatus)* Krutzsch

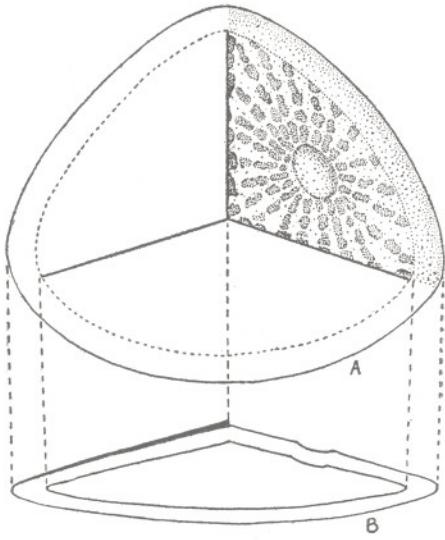
1966 — cf. *Dulhuntyispora* sp. Potonié

1967 — *Stenozonotriletes (Stellatus)* Chlonova in Drugg.

Type Species — *Asterisporites* (as *Stenozonotriletes*) *stellatus* Chlonova, 1960.

Generic Diagnosis — Roundly triangular miospores with convex sides and rounded angles. Trilete-mark distinct almost reaching up to the equatorial margin, simple. Interradial areas on the spore ornamented with grana, verrucae, baculae rugulae or striations converging around a central circular-oval depression. This radiating portion of the ornamentation gives the spore a characteristic appearance. Exine thick.

Comparison and remarks — *Stenozonotriletes* (Naumova, 1937) ex Naumova 1953, emended Potonié (1958), a common Lower Carboniferous genus, is a cingulate spore with a narrow cingulum and laevigate exine and thus, not comparable with *Asterisporites*. Hence, the assignment of similar spores to



TEXT-FIG. 1 — Organization of *Asterisporites* gen. nov. A. Schematic diagram showing the thick spore wall, trilete mark and the asteroid ornamentation around a circular depression (shown only in one interradial area) B. Sectional view.

Stenozonotriletes by Chlonova (1962, 1966) is not correct.

Antulsporites Archangelsky & Gamarro (1966), is also a cingulate spore with a proximally smooth and distally sculptured-baculate, verrucate exine. The sculptured elements are crowded uniformly in the distal area and thus, are not comparable to the genus proposed here.

Cingulitriletes Pierce, 1961, emended Dettmann (1963), differs in possessing a radially striated cingulum and low set distal sculpture.

Cingulatisporites Thomson in (Thomson & Pflug, 1953) emended Potonié (1958), distinguishes in possessing a laevigate cingulum and uniformly ornate central body.

Neevisporites de Jersey and Patten (1964), described from the Triassic — lower Jurassic sediments can be differentiated by the prominent arcuate ridges as in *Retusotriletes* Naumova (1953) and irregularly distributed verrucose ornamentation in the interradial regions of the spore body. This spore genus is interpreted as cingulate by de Jersey & Patten (1964) and Reiser & Williams (1969).

Taurocusporites Stover, 1962 emended Playford and Dettmann (1965), is characterized by circumpolar ridges and variously distributed ornamentation and as such

is not comparable. *Polycingulatisporites* Simoncsics and Kedves 1961 emend. Playford & Dettmann (1965), is also a comparable spore genus but is differentiated by its non-ornate spore body. Playford & Dettmann (*l.c.*) use this criterion to differentiate these two genera which is taken as valid for comparisons in this present paper.

Staplinisporites Pocock (1962) though ornamented with radial anastomosing muri is differentiated by a circumpolar ridge.

Apiculatisporis, *Verrucosisporites*, *Concavissimisporites*, *Impardecispora* and other ornate spore genera are not comparable to *Asterisporites* which is distinguished by its interradial ornamentation consisting of radiating sculpture, one each situated in the inter radial areas.

The following species belong to *Asterisporites* Gen. nov.

1. *Asterisporites stellatus* (Chlonova) comb. nov.
Stenozonotriletes stellatus Chlonova, 1960.
Holotype — Chlonova, 1960, pl. 3, fig. 22 and 1962, pl. 1, fig. 4.
2. *Asterisporites radiatus* (Chlonova) comb. nov.
Stenozonotriletes radiatus Chlonova, 1962 and 1964.
Taurocusporites radiatus Krutzsch, 1966.
Holotype — Chlonova, 1962, pl. 1, fig. 3 and Chlonova, 1964, pl. 1, figs. 2 and 3.
3. *Asterisporites Chlonovae* Doering, comb. nov.
Taurocusporites Chlonovae Doering, 1966.
Holotype — Doering, 1966, pl. 1, figs. 7-9.

DESCRIPTION

Circular to roundly triangular cingulate miospores with convex sides and rounded angles, 40-60 μ (30 specimens measured). Y-mark distinct, simple reaching up to the equatorial exine margins, rays bordered with ornamentation mostly consisting of regular ends or anastomosing grana and verrucae. Inter radial area ornamented with distinct rugulae, verrucae or grana coalescing to form vermiculate ridges around a distinct circular depression, the sculptural pattern radiates from this central depression in the form of asteroid ridges, giving the spores a characteristic appearance, a character used in circumscribing the genus. Exine is up to 6 μ thick. In several specimens studied by us (Pl. 1, Figs. 2, 3, 8, 9a, b) an ill-defined pore like area is seen at the

terminating points of the trilete rays. These three pores do show an organizational regularity, the function of which is not known. Similar pore-like openings are also seen in *Rouseisporites* Pocock (1962).

COMPARISON AND REMARKS

Asterisporites stellatus, originally described as *Stenozonotriletes stellatus* by Chlonova (*l.c.*) has distinct striations radiating from a circular inter radial depression. *A. radiatus* also described as *Stenozonotriletes* has distal thickenings in addition to the radial ornamentation. This species was later transferred to *Taurocusporites* by Krutzsch (1966). This transfer is not correct as discussed above. *Taurocusporites* as characterized by Stover (*l.c.*) is restricted to spores with distal circumpolar ridges. The radial striations surrounding the central depression in *A. radiatus* are continuous and are not formed by coalescing minor sculptural elements.

The three species presently known and referred to *Asterisporites*, show a distinct evolutionary pattern in the organization of the ornamentation. *A. chlonovae* (see Figs. of Doering pl. 1, figs. 7-9 and those illustrated here) has broad irregular occasionally anastomosing verrucae arranged in a radiating pattern. This species as recorded here is from the Upper Jurassic-Lower Cretaceous sediments; it is also recorded from the Wealden E & G and Neocomian-Aptian sediments of Germany (Doering, 1966). *A. radiatus* and *A. stellatus* recorded from the Cenomanian-Turonian sediments of

Western Siberian lowlands are index fossils (Chlonova, 1962).

These two species show an advanced organization of sculpture wherein the ornamentation consisting of radiating ridges or striations diverges from the central-inter radial depressions. Specimen illustrated and attributed to *S. stellatus* by Drugg (1967) perhaps needs further study, as the inter-radial depressions are not clearly seen in the illustration.

Spores illustrated and described as *Stenozonotriletes exuberans* Chlonova (1962 & 1964) under the "group C radiata" needs further study. As this specimen is not available to us we defer any comment on inclusion of this species in *Asterisporites*. Similarly spores described as *Taurocusporites* cf. *T. segmentatus* Stover 1962, by Drugg (1967, pl. 7, fig. 2) and *Taurocusporites* sp. by Norton and Hall (1969, pl. 2 fig. 5) are comparable to *Asterisporites* but need further detailed study. However, as the specimens lack a circumpolar ridge they cannot be assigned to *Taurocusporites*. *Neevisporites* de Jersey and Patten closely compares with the spores discussed above.

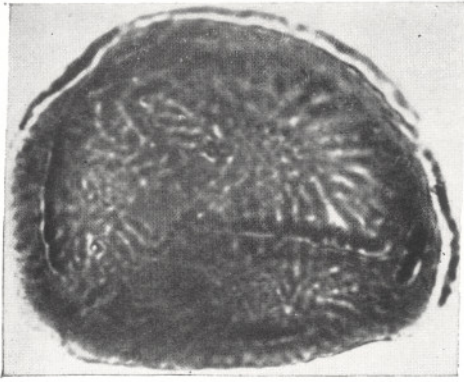
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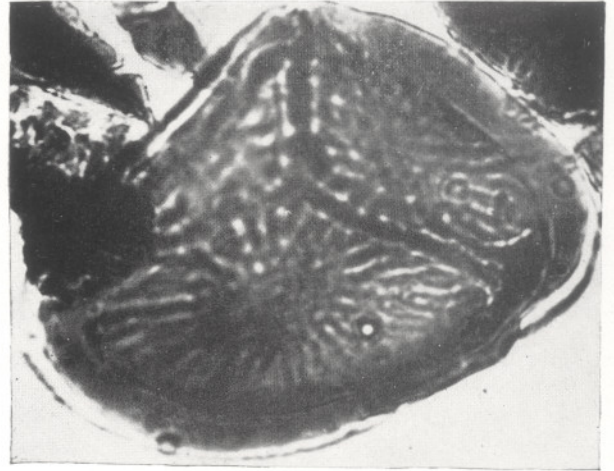
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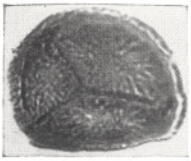
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1 b



4 b



1 a



2



3



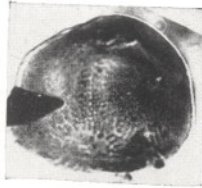
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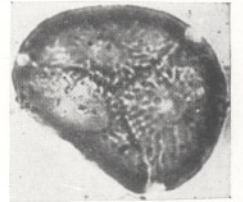
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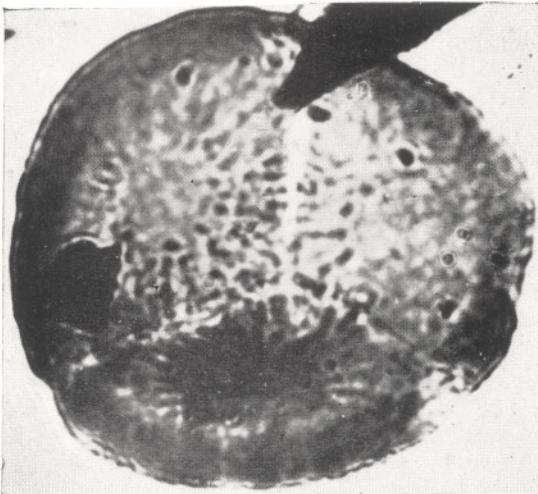
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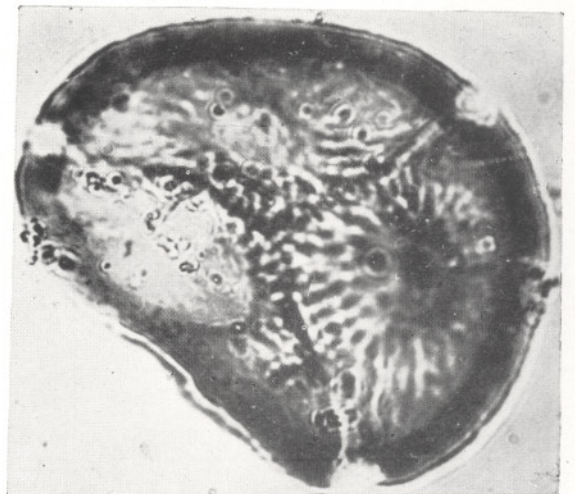
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9 a



10



9 b

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EXPLANATION OF PLATE

(Slides preserved at the Palynology Laboratory, Institute of Petroleum Exploration, Oil & Natural Gas Commission, Dehra Dun. Figs. 1b, 4b, 9b and 10 are enlarged ca. $\times 1000$ and Figs. 1a, 2-9a are enlarged ca. $\times 500$).

PLATE 1

1-10. *Asterisporites chlonovae* Doering, 1966, Comb. nov.