

MESOZOIC OPERCULATE POLLEN AND THEIR MORPHOLOGY

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ABSTRACT

Operculate pollen referable to the subturma *Operculati* Venkatachala and Goczan, are common in the Mesozoic sediments. The genera included under this group are *Classopollis* (Pflug) Pocock and Jansonius, 1961; *Gliscopollis* gen. nov. [= *Corollina* MALJAWKINA, 1949 and *Circulina* (Maljawkina) KLAUS, 1960] and *Granuloperculatipollis* Venkatachala and Goczan, 1963. All the three genera are monoporate often with a distinct distal operculum and possessing a faintly discernible to distinct proximal trilete mark.

Two main trends of specialization could be visualized in the group: (i) disappearance of the trilete mark and (ii) prominence and delimitation of the ring tenuitas bordering the operculum.

Pollen belonging to this group are known to occur among the conifers referable to Cheirolepidaceae.

INTRODUCTION

POLLEN grains referable to subturma *Operculati* are common in Mesozoic sediments. Their morphology has attracted the attention of various investigators (BALME, 1957; COUPER, 1958; KLAUS, 1960; KRUTZSCH, 1955; PFLUG, 1953; POCOCK & JANSONIUS, 1961; VENKATACHALA & GOZZAN, 1964 and others).

The present note attempts to review genera that could be included under this group and present a scheme usable in stratigraphical considerations.

SYSTEMATIC PALYNOLOGY

Subturma — *Operculati* Venkatachala & Goczan, 1964

Diagnosis — Monoporate pollen grains often with a distinct, distal operculum and possessing a faintly discernible to distinct proximal trilete mark.

Organization — Pollen grains included in this subturma are distinctly, distally operculate and porate. The operculum is either delimited by a simple tenuitas or bordered by striations. The triradiate mark on the proximal face may be distinct, indistinct or sometimes absent.

Remarks — The genera that are presently included here are *Classopollis* (Pflug, 1953)

Pocock & Jansonius, 1961; *Gliscopollis* gen. nov. [to replace *Corollina* (Maljawkina) Venkatachala & Goczan, 1964] and *Granuloperculatipollis* Venkatachala & Goczan, 1964.

Classopollis (Pflug) Pocock & Jansonius, 1961

Holotype — *Classopollis classoides* Pflug, 1953.

Remarks — In a recent paper Pocock & Jansonius (1961) have reexamined all the available literature and reviewed the genus *Classopollis*. The genus is here referred to in the emended sense. The genus was instituted by Pflug (1953) to accommodate monoporate, equatorially banded, operculate pollen grains; this can be clearly seen in his photo-illustrations but as this fact was not recognized by him he diagnosed the genus as follows: “. tricolporate, rarely tetracolporate, rimula well developed, geminales gaping. Poles never quite identical in appearance”. The pollen-grains of *Classopollis* in oblique flattening do look like tri- or tetracolporate pollen.

Couper (1955 & 1958), Balme (1957) and others have reinterpreted the morphology (for a detailed discussion, see POCOCK & JANSONIUS, 1961).

The illustrations of the holotype of the type species and other co-types illustrated by Pflug (1953) are in support of the observations of Pocock & Jansonius (*l.c.*) that are confirmed here.

Pocock & Jansonius (1961) do not mention the operculum. The operculum is delimited and bordered by equatorial striations or exoexinal thickenings representing a ring tenuitas, which can clearly be seen in equatorially flattened grains, while in polar view they are seen only as broad, irregularly demarcated puncta on the equator.

Klaus (1960) emended the genus *Corollina* Maljawkina, 1949, and indicated *Classopollis* Pflug, 1959 as a synonym. The emendation of Klaus (*l.c.*) as discussed by Pocock & Jansonius (1961) is not acceptable because the illustrations of Maljawkina (1949) convey

little and her description is not adequate to define the genus.

Maljawkina (1959) describes two operculate genera *Corollina* and *Circulina*. The diagnosis of these are as follows:

Corollina Maljawkina, 1949.

"The contour of the pollen grains round, edge separated from the body clearly, the outer edge thickened, wide and somewhat swollen, its colour being darker than that of the body. Exine thick, body and edge punctate with a pattern of fine net work".

Circulina Maljawkina, 1949

"The contour oval, the edge is sharply separated from the body, narrow, doubled. Exine medium-thick and covered by regular striations having radial orientation, exine punctate."

The description given for *Circulina* can easily accommodate *Classopollis* Pflug, 1953. The illustration given by Maljawkina to supplement her description does not show the essential characters of the genus. This point has been discussed by Pocock & Jansonius (1961). The name *Classopollis* as emended by them is retained here.

***Gliscopollis* gen. nov.**

Syn. —

Corollina Maljawkina, 1949

Circulina Maljawkina ex Klaus, 1960

Corollina (Maljawkina) Venkatachala & Goczan, 1964

Type species — *Gliscopollis meyeriana* (KLAUS, 1960) comb. nov.

Remarks — Klaus (1960) also emended the genus *Circulina*. In his emended diagnosis he has modified the original diagnosis. In his circumscription, pollen with a smooth, nonstriated exine are included under the generic name *Circulina*, while in the original diagnosis Maljawkina (*l.c.*) includes equatorially striated pollen under this genus and smooth-walled ones under *Corollina* (*see* translation). This might have arisen due to an error in translation. Since the illustration and description of the type species as given by Maljawkina (1949) are not sufficient to diagnose the genus, a new name is proposed here to accommodate the smooth walled pollen. The emendations of Klaus (1960) are thus not acceptable.

Generic Diagnosis — (From VENKATACHALA & GOCZAN, 1962.) Pollen grains

circular-oval, operculate, distinctly monoporate. Equatorial tenuitas or weakened area present separating the operculum. Triradiate or triangular scar present on the proximal pole. Exine smooth — infrapunctate.

Derivation of name — Latin: *Glisc/o* = swell

Description — (Elaborated from VENKATACHALA & GOCZAN, 1964). Pollen grains originally globular, circular in polar view and lenticular in oblique and equatorial compressions; secondary folds formed only in the equatorially flattened specimens. Commonly seen as tetrads. Distally the exine thins out in the form of a ring demarcating the operculum, pore or a weak ill-defined 12-15 μ wide region present on the distal operculum. Several grains with detached operculum have been observed.

In fossil conditions it is difficult to assess the function of the trilete-scar and the pore. The triangular-trilete scar however, appears to be a non-functional tetrad compression mark. The fact that in some grains the mark is either weakly present or totally absent strengthens this contention. Exinal ornamentation smooth or infrasculptured. The following species belong to *Gliscopollis* gen. nov.

***Gliscopollis meyeriana* (Klaus) comb. nov.**

Syn. —

Circulina meyeriana Klaus, 1960

Corollina meyeriana (Klaus) Venkatachala & Goczan, 1964

For diagnosis & description — see Klaus, 1960, p. 165.

***Granuloperculatipollis* Venkatachala & Goczan, 1964**

Type Species — *Granuloperculatipollis rudis* Venkatachala & Goczan, 1964.

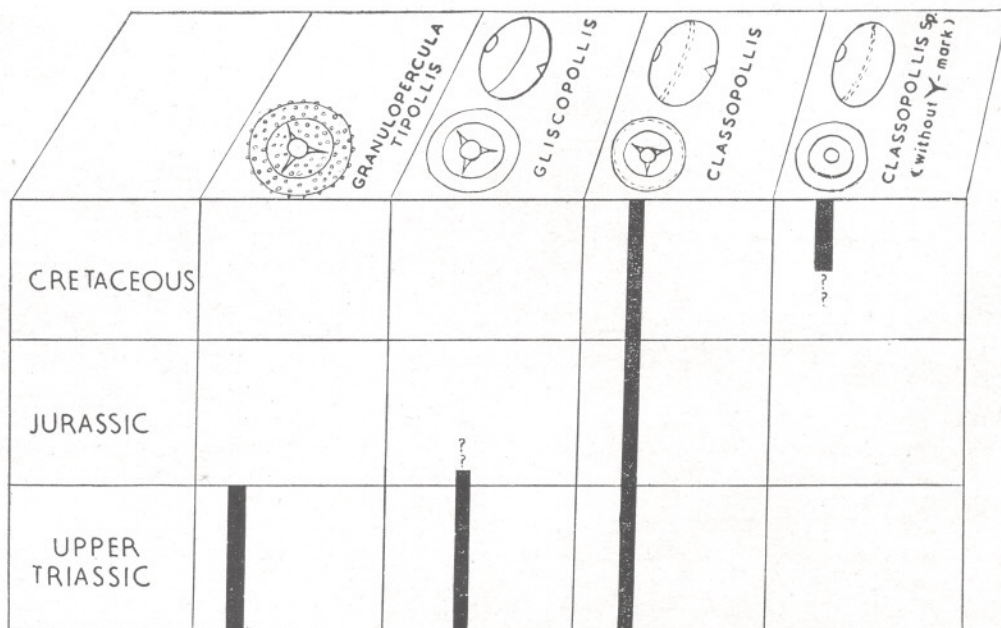
Generic Diagnosis — (From VENKATACHALA & GOCZAN, 1964) — Operculate, porate, granulose pollen grains, Y-scar present but hardly perceptible.

Generic Description — See Venkatachala & Goczan, 1964.

TRENDS OF SPECIALIZATION AND STRATIGRAPHICAL REMARKS

The main trends of specialization could be visualized in this group are:

- (1) disappearance of the trilete mark.
- (2) prominence and delimitation of the ring tenuitas.



TEXT-FIG. 1

In the Upper Triassic all the three genera *Granuloperculati-pollis*, *Gliscopollis* and *Classopollis* are seen. The trilete mark is very distinct and often is clearly delimited in *Gliscopollis* while it is obscured in *Granuloperculati-pollis*. In *Classopollis* however, it is discernible but not well demarcated.

The ring tenuitas delimiting the operculum is not very clearly seen or marked in *Granuloperculati-pollis* but is clearly limited by a ring furrow in *Gliscopollis*. On the other hand in *Classopollis* the ring furrow or the tenuitas is bordered by a series of exoexinal thickenings which look like striations or dotted lines. The tendency towards stabilization and delimitation of the tenuitas is remarkably illustrated side by side with the trend towards obliteration of the trilete scar, as a non-functional tetragonal compression mark.

Granuloperculati-pollis is known only from the Upper Triassic sediments while *Classopollis* and *Gliscopollis* continue to extend into the Lower Jurassic (Liassic) sediments. *Gliscopollis* is not known to be represented in the Upper Jurassic and younger sediments (see TEXT-FIG. 1). *Classopollis*, however, continues to be present throughout the Mesozoic section. Species of *Classopollis*, which do not have any tetrad-scar with

well-defined tenuitas and operculum, is known to occur only in the Cretaceous sediments. The species of *Classopollis* encountered in the Cretaceous and the Paleocene sediments are characteristically small with well defined distal pore and well-demarcated distal operculum and can be referred to *C. obidosensis* and *C. major* described by Groot & Groot (1962).

Affinity — *Classopollis* and related genera are known to occur among the conifer referable to *Cheirolepidaceae*. Hörhammer (1933) described pollen assignable to *Classopollis* from *Cheirolepis munsteri* Schenk. He, however, did not recover the pollen from cones attached to identifiable remains of *Cheirolepis*. Couper (1958) recovered *Classopollis* pollen from the Lower Jurassic of Wales associated with *Cheirolepis munsteri*.

Kendall (1949) described similar pollen from *Brachyphyllum scottii* Kendall.

Couper (1955, 1958) in a reexamination of pollen from a cone attributed to *Pagiophyllum conivens* Kendall (1952) compared them to *Classopollis torosus*.

From the records described above it is clear that pollen of the type discussed here were produced by gymnospermous plants, like *Cheirolepis*, *Brachyphyllum* and *Pagiophyllum*.

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