

# SPORAE DISPERSAE IN THE COALS OF PENCH-KANHAN AND PATHAKHERA COALFIELD (M.P.), INDIA

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## ABSTRACT

The present paper contains a systematic description of the miospore assemblage recovered from the Lower Gondwana coals of PENCH-KANHAN and PATHAKHERA coalfields. It has been referred to 37 genera and 61 species out of which 5 species are new. The morphographic characters of the new species have been described in detail.

## INTRODUCTION

SO far no account of *Sporae dispersae* from the coals of the above said areas is known. The present work contains a detailed morphographic description and classification of the miospores occurring in the coals of PENCH-KANHAN and PATHAKHERA (Lower Barakar) coalfields.

The material for the present investigation consists of some bore-hole coal samples from Pathakhera and PENCH-KANHAN coalfields and channel samples from the working collieries of PENCH-KANHAN Coalfield.

## SYSTEMATIC DESCRIPTION

The *Sporae dispersae* of PENCH-KANHAN and PATHAKHERA coalfields include a number of trilete, monolete, monosaccate, bisaccate, and alete miospores. Large number of specimens were studied and the important exine characters were taken into consideration for the delimitation of various genera and species. The species referred to the spore genera are more or less similar to those already discussed by BHARADWAJ (1962) and BHARADWAJ and SALUJHA (1964). The various genera and species have been classified and arranged according to the scheme of POTONIÉ (1956, 1958, 1960). All the 37 genera and 61 species recovered in the present investigation have been listed here. The species marked by the asterisk are new and have been described in detail.

*Callumispora barakarensis* Bharad. & Sriv.

*Callumispora gretensis* (Balme & Henn.) Bharad. & Sriv.

*Hennellysporites diversiformis* (Balme & Henn.) Tiw.

*Hennellysporites indicus* Tiw.

*Lophotriletes rectus* Bharad. & Sal.

\**Horriditriletes pathakheraensis* sp. nov.

*Brevitriletes levis* (Balme & Henn.) Bharad. & Sriv.

*Brevitriletes jhingurdahiensis* Sinha

*Brevitriletes unicus* (Tiw.) Bharad. & Sriv.

*Microbaculispora tentula* Tiw.

*Microbaculispora barakarensis* Tiw.

*Microbaculispora indica* Tiw.

*Microfoveolatispora directa* (B. & H.) Bharad.

*Pseudoreticulatispora barakarensis* Bharad. & Sriv.

*Indotrivadites surangei* Tiw.

*Indotrivadites sparsus* Tiw.

*Plicatipollenites indicus* Lele.

*Cannanoropollis mehtae* (Lele) Bose & Maheshw.

*Cannanoropollis densus* (Lele) Bose & Maheshw.

*Cannanoropollis talcherensis* Sriv.

*Crucisaccites indicus* Sriv.

*Parasaccites korbaensis* Bharad. & Tiw.

*Parasaccites distinctus* Tiw.

*Parasaccites diffusus* Tiw.

*Parasaccites singrauliensis* Sinha

*Caheniasaccites indicus* Sriv.

*Potonieisporites barrelii* Tiw.

\**Potonieisporites densicarpus* sp. nov.

*Potonieisporites* sp.

*Misrapollenites barakarensis* Anand-Prakash

*Lueckisporites* sp.

*Primuspollenites obscurus* Tiw.

*Primuspollenites ovatus* Sinha

*Primuspollenites distinctus* Sinha

*Rhizomaspora indica* Tiw.

*Striatites communis* Bharad. & Sal.

*Striatites tentulus* Tiw.

*Striatites multistriatus* (B. & H.) Tiw.

\**Verticipollenites simplex* sp. nov.

*Lahirites raniganjensis* Bharad.

*Strotersporites indicus* Tiw.

*Striatopodocarpites magnificus* Bharad. & Sal.

*Striatopodocarpites decorus* Bharad. & Sal.

*Striatopodocarpites venustus* Bharad. & Sal.

*Lunatisporites fuscus* Bharad.

*Faunipollenites varius* Bharad.

*Faunipollenites perexiguus* Bharad. & Sal.

*Illinites hennellyi* (Hart) Sinha

*Illinites rectus* (Leschik) Gr. & Schw.

*Illinites* sp.

*Sulcatisporites maximus* (Hart) Singh

*Sulcatisporites tentulus* Tiw.

*Vesicaspora distincta* Tiw.

*Vesicaspora ovata* (B. & H.) Hart

\**Platysaccus densicarpus* sp. nov.

*Cuneatisporites* sp.

*Ibisporites diplosaccus* Tiw.

*Vittatina permegna* Tiw.

*Tiwariasporis flavatus* Maheshw. & Kar

*Tiwariasporis gondwanensis* (Tiw.)

Maheshw. & Kar

*Tiwariasporis simplex* Maheshw. & Kar

*Ginkgocycadophytus cymbatus* (B. & H.)

Pot. & Lele

*Pilasporites simplex* var. *major* Sinha

*Hemisphaerium singrauliensis* Sinha

\**Hemisphaerium punctatus* sp. nov.

Anteturma — *Sporites* H. Pot., 1893

Turma — *Triletes* (Reins.) Pot. & Kr., 1954

Subturma — *Azonotriletes* Lub., 1935

Infraturma — *Apiculati* (Benn. & Kidst.) Pot., 1956

Genus — *Horriditriletes* Bharad. & Sal., 1964

Genotype — *Horriditriletes curvibaculosus* Bharad. & Sal., 1964.

*Horriditriletes pathakheraensis* sp. nov.

Pl. 1 Figs. 1-3

Holotype — Pl. 1, Fig. 1.

Isotype — Pl. 1, Fig. 2.

*Locus typicus* — Bore-hole No. PK-82. 1574 A(C)E, Pathakhera Coalfield, M.P. India.

*Stratum typicum* — Barakar Stage, Damuda Series, Lower Gondwana, India.

*Diagnosis* — Miospores triangular; trilete mark well defined, reaching almost upto the corner; bacula 1-2  $\mu$  high  $\times$  1-2  $\mu$  wide, closely set.

*Description* — Miospores are triangular in over all shape. Size ranges from 34-44  $\mu$ , holotype 35  $\mu$ . Trilete mark is distinct, reaching  $\pm$  upto the angles. Exine is

densely covered on both the surfaces with 1-2  $\mu$  high blunt bacula, 16-20 bacula have been counted along the *extrema lineamenta*.

*Comparison* — Among the comparable species *Horriditriletes curvibaculosus* Bharad. & Sal. (1964) has bigger, sparser and curved bacula and hence differs from the present species. *Horriditriletes brevis* Bharad. & Sal. (1964) differs in having smaller size and restricted distribution of bacula (Tiwari, 1968, p. 228).

Anteturma — *Pollenites* R. Pot., 1931

Turma — *Saccites* Erdt., 1947

Subturma — *Monosaccites* (Chit.) Pot. & Kr., 1954

Infraturma — *Vesiculomonoraditi* (Pant) Bharad., 1956

Genus — *Potonicisporites* (Bhard.) Bharad., 1964

Genotype — *Potonicisporites novicus* Bharad., 1965.

*Potonicisporites densicarpus* sp. nov.

Pl. 1 Figs. 4-5

Holotype — Pl. 1, Fig. 4.

Isotype — Pl. 1, Fig. 5.

*Locus typicus* — Main working seam, Ghorawari Colliery, Pench-Kanhan Coalfield, M.P. India.

*Stratum typicum* — Barakar Stage, Damuda Series, Lower Gondwana, India.

*Diagnosis* — Pollen grains subcircular to sub-oval; holotype 98  $\times$  130  $\mu$  in size; central body big,  $\pm$  74  $\mu$  in holotype, circular and dense; monolete mark distinct; saccus narrow, uniformly wide or lesser in width on two sides, finely intrareticulate.

*Description* — Known size is 110-130  $\mu$ . Central body is dark brown, thick and finely intrapunctate. Monolete mark is usually distinct, straight or bent and about 1/2 the body radius long. The body infolds are small and usually not prominent. Saccus intrareticulation is fine in nature; the width of the saccus is uniform all round but some times it is lesser on two lateral sides.

*Comparison* — The present species differs from *Potonicisporites neglectus* Pot. & Lele (1961) in having a denser body and ill-developed peripheral folds in the body. *Potonicisporites barrelis* Tiwari (1965) has a thinner barrel-shaped body. From other known species, *Potonicisporites densicarpus*

sp. nov. differs in the nature of thick inner body, well defined monolete mark, ill-developed body folds and a narrow, finely reticulate monosaccus.

*Potonieisporites* sp.

Pl. 1, Fig 6

*Description* — Pollen grains are oval to subcircular in overall shape. Known size ranges from  $70 \times 120 \mu$  —  $180 \times 110 \mu$ . Central body is mediumly thick and finely intramicroreticulate. Monolete mark is usually indistinct, straight and small in size. Body folds are distinct. Width of saccus is usually uniform all round but in some specimens it is less on two lateral sides. Saccus intrareticulation is fine in nature.

*Remarks* — The specimens differ from *Potonieisporites barrelis* in the nature of the body and the monolete mark.

**Subturma** — *Disaccites* Cook., 1947

**Infraturma** — *Striatiti* Pant, 1954

**Genus** — *Lueckisporites* (Pot. & Kl.) Kl., 1963

*Genotype* — *Lueckisporites virkkii* Pot. & Kl., 1954.

*Lueckisporites* sp.

Pl. 2 Fig. 20

*Description* — Pollen grain is bilaterally oval in shape,  $60 \times 96 \mu$  in size. Central body is thin, laevigate and horizontally oval. Proximally two taeniae are present over the central body, measuring  $28 \times 70 \mu$  each. Taeniae are coarsely intramicroreticulate. Sacci are proximally equatorially attached and distally inclined forming a  $\pm 10 \mu$  wide and straight sulcus. Sacci coarsely intrareticulate.

*Remarks* — The present specimen is characterised by the presence of a wide sulcus, horizontally oval central body and a distinct zone of sacci attachment, but since the number of specimens is less, the range of variation could not be studied.

**Genus** — *Verticypollenites* Bharad., 1962

*Genotype* — *Verticypollenites secretus* Bharad., 1962.

*Verticypollenites simplex* sp. nov.

Pl. 1, Figs. 7-8

*Holotype* — Pl. 1, Fig. 7

*Isotype* — Pl. 1, Fig. 8

*Locus typicus* — Main working seam, Kalichhappar Colliery, Pench-Kanhan Coalfield, M. P., India.

*Stratum typicum* — Barakar Stage, Damuda Series, Lower Gondwana, India.

*Diagnosis* — Bilateral pollen grains. Holotype  $30 \times 70 \mu$ . Central body subcircular, dense, bearing 5-8 horizontal striations, without any vertical partitions. Saccus narrow, slit like. Sacci small, pitcher-shaped.

*Description* — Pollen grains are diploxylonoid in shape. Size range is  $37 \times 47 \mu$  to  $65 \times 85 \mu$ . Central body is distinct,  $35 \times 37 \mu$  —  $30 \times 35 \mu$  in size, marginal rim around central body is absent. Proximally exine is microverrucose. Sacci are subspherical, pitcher shaped, zones of saccus attachment are not full length. Sulcus is straight. Saccus intrareticulation is medium sized.

*Comparison* — Present specimens can be compared with *Verticypollenites subcircularis* Bharad. & Sal. (1964) in the morphological characters but for the marginal rim around the central body which is absent in the specimens from the present assemblage.

**Infraturma** — *Disaccitrileti* Lesch., 1955

**Genus** — *Illinites* (Kos.) Pot. & Kl. in Pot. & Kr., 1954

*Genotype* — *Illinites unicus* Kos., 1950

*Remarks* — Grebe and Schweitzer (1962, p. 2) have given a complete account of various pollen grains found in the cones of *Ullmannia frumentaria*. After studying the variations, these authors consider that smaller forms with a monolete, bilete or vestigial trilete should find their place in the dispersed pollen grain species *Illinites delasaucei* (Pot. & Kl.) Grebe & Schw. (1962). Recently Bharadwaj (1964) has studied *in situ* pollen grains of *Lebachia*, *Ernestiodendron*, *Walchianthus* and some species of the dispersed pollen grain genus *Potonieisporites*. In his opinion, the bigger monosaccoid forms with a germinal mark should be classified under the genus *Potonieisporites* (Bharad.) Bharad., while smaller

forms with more bisaccoid tendency should find their place in *Illinites*. This view point has been followed in the present work.

*Illinites* sp.

Pl. 2, Fig. 13

**Description** — Pollen grain is bilaterally oval in over all shape and size measuring  $60 \times 100 \mu$ . Central body is distinctly defined, thick, circular in shape and is  $50 \mu$  in diameter. Monolete mark is distinct, simple and slightly curved. Saccus is slightly larger than the central body, lateral continuation is  $\pm 8 \mu$  wide; saccus is intrareticulate, meshes being fine.

**Remarks** — Only one specimen of the above circumscription has been found which does not resemble with the known species of the genus.

**Infraturma** — *Podocarpoiditi* Pot., Thom. & Thierg., 1950

**Genus** — *Platysaccus* (Naum.) Pot. & Kl., 1954

**Genotype** — *Platysaccus papilionis* Pot. & Kl., 1954

*Platysaccus densicarpus* sp. nov.

Pl. 2, Figs. 14-15

**Holotype** — Pl. 2, Fig. 14.

**Isotype** — Pl. 2, Fig. 15

**Locus typicus** — III Seam, Chandameta Colliery, Pench-Kanhan Coalfield, M.P., India.

**Stratum typicum** — Barakar Stage, Damuda Series, Lower Gondwana, India.

**Diagnosis** — Holotype  $94 \times 140 \mu$ . Pollen grains diploxylooid. Central body circular, thick,  $62 \mu$  in diameter in holotype. Exine finely microverrucose. Saccus sub-circular, distally forming an ill-defined, narrow sulcus. Intrareticulation of saccus  $\pm$  fine.

**Description** — Pollen grains are bisaccate and are usually  $70 \times 94 \mu$  -  $90 \times 140 \mu$  in size. Central body is circular,  $32-62 \mu$  in size, dense but without any marginal rim, exine is finely microverrucose, no striations are present over the proximal surface. Sacci are larger than the central body being  $70-94 \mu$  high; their attachment on the distal surface of the body is

full length. Laterally the sacci come close to each other. Zone of saccus attachment is not sharply defined.

**Comparison** — *Platysaccus ovatus* Maithy (1965) differs in having elliptical body, and *Platysaccus hingirensis* Tiwari (1968) has usually thinner body with laevigate exine. *Platysaccus brevizonatus* Tiwari (1968) has pitcher-shaped sacci hence it differs from the present species. *Platysaccus leschiki* Hart (1960) has thinner body and mono-saccoidal construction with smaller sacci.

**Genus** — *Cuneatisporites* Lesch., 1955

*Cuneatisporites* sp.

Pl. 2, Fig. 16

**Description** — Size of the pollen grain is  $70 \times 110 \mu$ . Central body is vertically oval in shape with round ends,  $40 \times 60 \mu$  in size. Exine is finely intramicroreticulate and without striations. Saccus attachment is full length, and a  $8 \mu$  wide sulcus is present. Saccus intrareticulation is fine in nature.

**Turma** — *Aletes* Ibr.

**Subturma** — *Azonaletes* (Lub.) Pot. & Kr., 1954

**Infraturma** — *Psilonapiti* Erd., 1947

**Genus** — *Hemisphaerium* Hemm. & Nyg., 1967

**Genotype** — *Hemisphaerium inominatum* Hemm. & Nyg., 1967.

*Hemisphaerium punctatus* sp. nov.

Pl. 2, Figs. 17-19

**Holotype** — Pl. 2, Fig. 17.

**Isotype** — Pl. 2, Fig. 18.

**Locus typicus** — IIIrd. seam, Chandameta Colliery, Pench-Kanhan Coalfield, M. P., India.

**Stratum typicum** — Barakar Stage, Damuda Series, Lower Gondwana, India.

**Diagnosis** — Holotype  $50 \times 62 \mu$ , circular to subcircular miospores, size range  $38 \times 52-60 \mu$ , usually splitting into two equal halves or getting folded to acquire oval shape; exine thin, finely and uniformly sculptured, *extrema lineamenta*  $\pm$  smooth.

**Description** — Miospores are circular to subcircular in over all shape and usually

split into two halves. Size ranges from 38-60  $\mu$ . Spores are usually folded in the middle. Exine is thin, lowly and densely sculptured, elements are distributed uniformly over the body. *Extrema lineamenta* is slightly uneven.

*Remarks*—The present specimens vary from the other species of the genus in their smaller size and the uniform and more prominent distribution of the sculptural elements.

## ACKNOWLEDGEMENT

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## EXPLANATION OF PLATES

(All photomicrographs magnified 500  $\times$ )

## PLATE 1

- 1-3. *Horriditriletes pathakheraensis* sp. nov. Slide nos. 4231, 4232, 4221.
- 4-5. *Potoniopsisporites densicarpus* sp. nov. Slide nos. 4233, 4215.
6. *Potoniopsisporites* sp. Slide no. 4231.
- 7-8. *Verticipollenites simplex* sp. nov. Slide nos. 4234, 4235.
- 9-10. *Faunipollenites varius*. Slide nos. 4236, 4237.

## PLATE 2

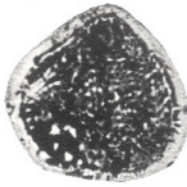
- 11-12. *Faunipollenites perexiguus*. Slide nos. 4238, 4239.
13. *Illinites* sp. Slide no. 4218.
- 14-15. *Platysaccus densicarpus* sp. nov. Slide nos. 4218, 4240.
16. *Cuneatisporites* sp. Slide no. 4241.
- 17-19. *Hemisphaerium punctatus* sp. nov. Slide nos. 4242, 4243, 4244.
20. *Lueckisporites* sp. Slide no. 4245.



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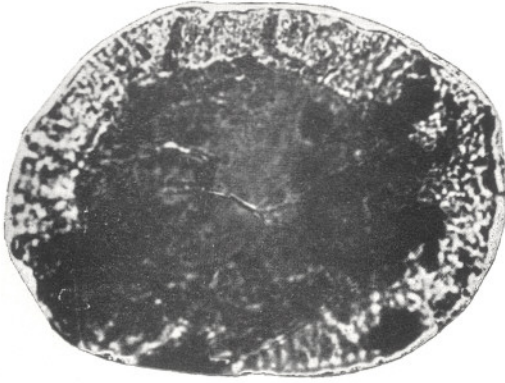
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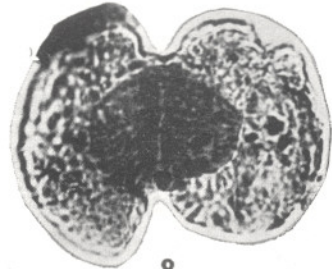
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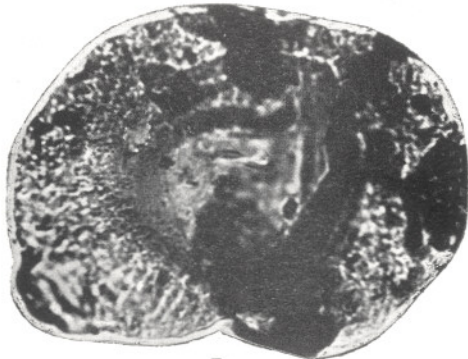
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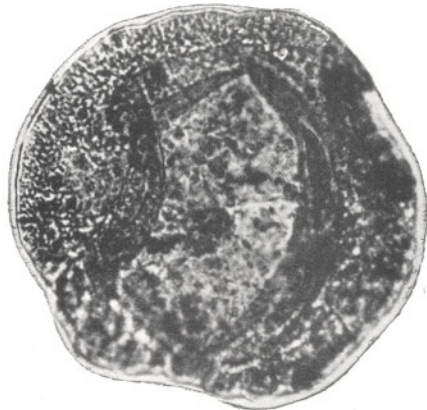
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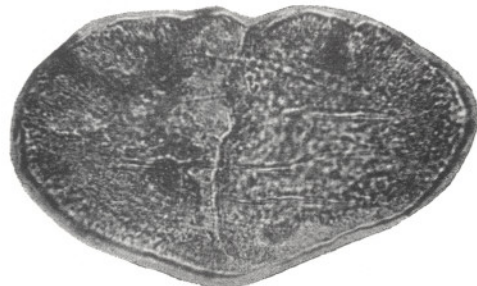
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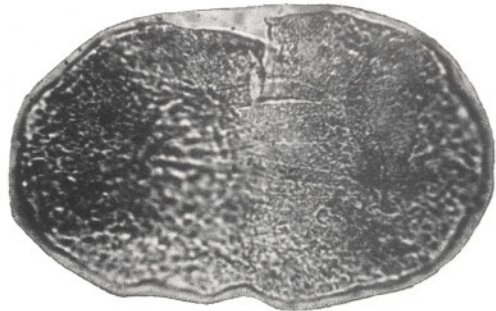
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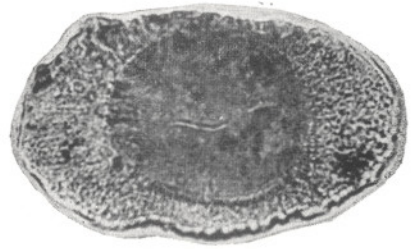
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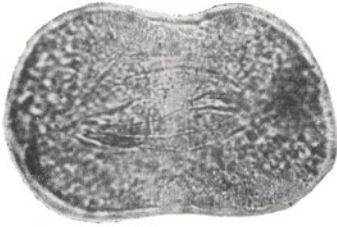
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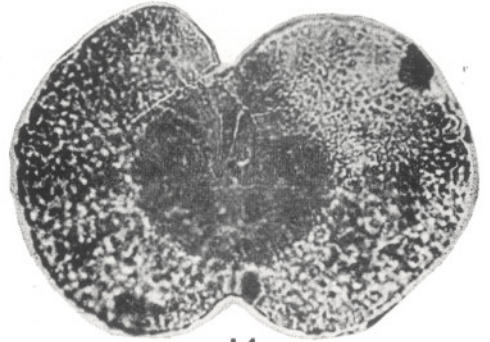
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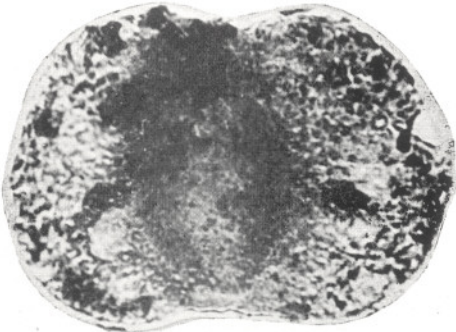
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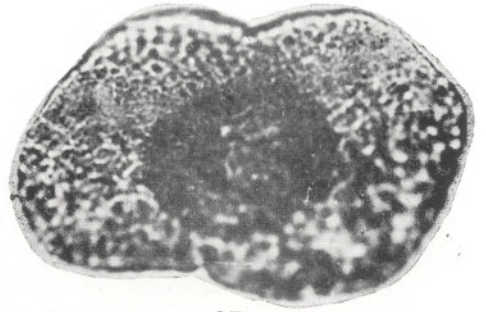
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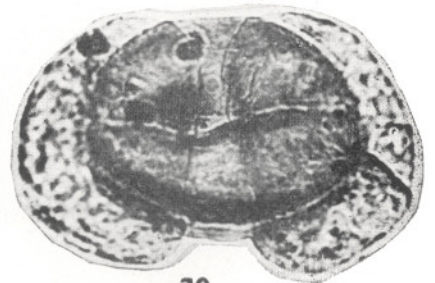
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