

The miospore genus *Fragilipollenites* Konyali emend. from the Silesian of Great Britain

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ABSTRACT – The miospore genus *Fragilipollenites* Konyali in Agrali *et al.*, 1965 is emended. The type species *F. radiatus* Konyali in Agrali *et al.*, 1965 is also emended and a new species *F. ganymedei* is described. The two species have a distinctive morphography which appears to be unique. The genus has been recorded sporadically from the Namurian and, more commonly, from the early Langsettian (Silesian) of on- and offshore Great Britain. *J. Micropalaeontol.* 16(1): 85–90, May 1997.

INTRODUCTION

The genus *Fragilipollenites* Konyali in Agrali *et al.*, 1965 was originally described from the earliest Langsettian of the Amasra Coalfield, Anatolia, northern Turkey. Subsequently many specimens assignable to this genus have been recorded from several sections in Great Britain but these records have not been published. This paper deals with the taxonomy of the genus and the species assigned to it, and documents their stratigraphical occurrence.

DESCRIPTIVE TERMINOLOGY

Where possible, terms defined by Potonié & Kremp (1955) and Grebe (1971) have been applied in this paper. Terminology relating to the attachment of exinal layers is taken from Neves & Owens (1966). However, the genus *Fragilipollenites* has a distinctive morphology which appears to be unique amongst miospores. For this reason it is necessary to define two new terms.

Chorde (pl. -ae) (Greek *chorde*: the string of a musical instrument) linear, wire-like sculptural elements, equidimensional in cross-section, which may or may not divide into branches. They are generally radially disposed and do not encircle the spore (Figs 1a,b).

The term *costa* in the sense of Thompson & Pflug (1953), Potonié & Kremp (1955) and Grebe (1971) is not used as it denotes rib-like sculptural elevations on the exine which encircle the spore. The term *chordae* is preferred to the term *muri* which are defined as elevations bounding lumina in a reticulum (Potonié & Kremp, 1955; Grebe, 1971) or as parallel sculptural ridges (Thompson & Pflug, 1953). Both of these uses of the term *muri* apply to definite palynological sculptural morphologies (e.g. that of *Dictyotriletes* Naumova ex Potonié & Kremp 1954 for reticulate *muri* and *Cicatricosisporites* Potonié & Gelletich 1933 for parallel *muri*) which are distinct from the sculpture of *Fragilipollenites*.

Cuppa (Latin *cuppa*: cup or cask) an open, more-or-less hemispherical cup-like structure, positioned on the distal polar region concentric with the equator such that the concave inner surface faces distally away from the miospore (Figs 1c,d).

SYSTEMATIC DESCRIPTIONS

Unless otherwise stated all figured and described specimens are housed in the slide collection of the Centre for Palynological Studies, Department of Earth Sciences, University of Sheffield.

Anteturma **Sporites** Potonié 1893

Turma **Triletes** (Reinsch) Dettmann 1963

Suprasubturma **Cameratitriletes** Neves & Owens 1966

Subturma **Membranatitriletes** Neves & Owens 1966

Infraturma **Cingulicamerati** Neves & Owens 1966

Genus *Fragilipollenites* Konyali emend.

1965 *Fragilipollenites* Konyali in Agrali *et al.*, p. 180.

Original diagnosis. Konyali in Agrali *et al.* (1965, p. 180): ‘Pollen monosaccate, sac à air circulaire inséré sur la face proximale d’un corps central arrondi. Sac transparent veiné par de fins bourrelets méridiens. Marque en Y rarement visible. Diamètre total du pollen égal à 2 ou 3 fois celui du corps central.’

Emended diagnosis. Zonate and variably camerate miospores bearing a cuppa with a sculpture of chordae.

Type species. *Fragilipollenites radiatus* Konyali in Agrali *et al.* emend.

Description. Trilete, camerate, zonate miospores. Amb circular or rounded triangular; interrational margins convex to more or less straight. Pronounced zona. Intexine and exoexine closely attached over the proximal and distal surfaces but the proximal and distal membranes of the exoexine forming the zona may be variably separated to produce a camera. Intexine concave-rounded triangular in equatorial outline. Distal exoexine bears a cuppa. Laesurae straight, extending to equator, accompanied by high labra; equatorial curvaturae perfectae or imperfectae present. Sculpture of chordae on the cuppa, and may also occur on the proximal and distal surfaces of the exoexine, the zona and the contact faces.

Remarks. The external structure of the genus is illustrated in Fig. 1.

Konyali (in Agrali *et al.*, 1965) assigned the genus to the Série (= Infraturma) *Triletesaciti* Leschik 1955 based upon the identification of a monosaccate structure. However, the genus clearly lacks an infrareticulate, saccate structure

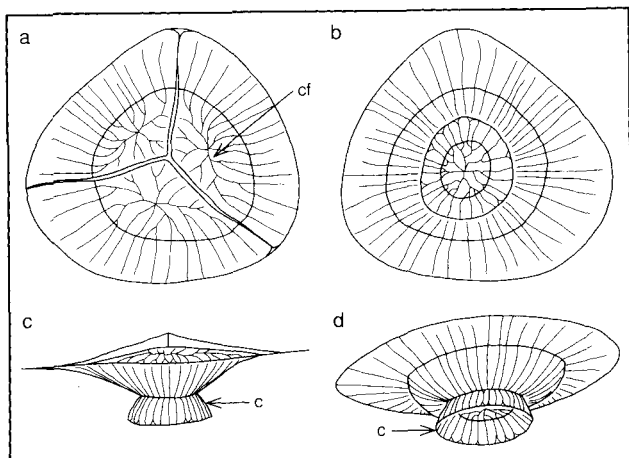


Fig. 1. Schematic illustration of *Fragilipollenites radiatus* Konyali emend. (a) Polar view of proximal surface showing radiating and dividing chordae on contact faces (cf). (b) Polar view of distal surface. (c) Equatorial view showing distal cuppa (c). (d) Oblique view of distal surface showing cuppa (c).

characteristic of the Turma Saccites Erdtman 1947 which contains the Infraturma Triletesaciti. The present emendation and suprageneric placement is based upon the reinterpretation of the structure of the genus as camerate and zonate and follows suggestions made by Owens *et al.* (1966) while dealing with the zonate genus *Kraeuselisporites* Leschik emend. Scheuring 1974. With Carboniferous specimens of this genus, Owens *et al.* (1966) recognized minor separation of the exine layers particularly in the equatorial plane adjacent to the spore body margin. They considered that the common, variable development of cameration in Carboniferous zonate miospores warranted their inclusion in the Infraturma Cingulicamerati Neves & Owens 1966, rather than the Infraturma Zonati Potonié & Kremp 1954 (the latter accommodating acamerate taxa). Comparable variable development of cameration is recognized in specimens of *Fragilipollenites* which is therefore assigned, with *Kraeuselisporites*, to Cingulicamerati.

Comparison. Other Palaeozoic zonate miospores such as *Kraeuselisporites* Leschik emend. Scheuring 1974 do not possess the distinctive distal structure nor the sculpture of chordae of *Fragilipollenites*. *Cirratriradites* Wilson & Coe 1940 bears distal polar foveae which are negative features rather than the pronounced positive cuppa of *Fragilipollenites*. *Pteroretis* Felix and Burbridge 1961 has superficially similar structure and sculpture but possesses several 'meridional wings' (i.e. which run between the proximal and distal poles) and does not have an equatorial zona or distal cuppa. Confusion in identification of these two

genera may be caused by their complicated structures and sculptures, and may be compounded where specimens are heavily folded or crumpled.

The type species of *Spencerisporites* Chaloner 1951, *S. radiatus* (Ibrahim) Winslow 1959 commonly possesses radiating folds on the exoexine which may appear similar to the chordae of *Fragilipollenites*. The contact area of *S. radiatus* bears a sculpture of fine, broken lines which radiate from three points placed symmetrically, one on each of the three contact faces (see Burbridge & Felix, 1976, pl. 2, fig. 3). This is reminiscent of, but much less obviously developed than the chordae on the contact faces of the species *Fragilipollenites radiatus* (see below). The contact faces of the variety *Spencerisporites gracilis dermatotylotus* Burbridge & Felix 1976 bears chordae-like sculpture but these form an irregular reticulum rather than a radiating pattern (see Burbridge & Felix, 1976, pl. 2, fig. 4). Furthermore, the genus *Spencerisporites* lacks a cuppa and possesses an equatorial flange.

Single elements (termed skiadions) of *Tetrapterites* Sullivan & Hibbert 1964 bear a cup-like structure (cupule of Sullivan & Hibbert (1964)), zona-like equatorial structure (wing) and radiating parallel-sided folds reminiscent of the chordae of *Fragilipollenites*. However the skiadions are interpreted as spore-bearing structures and as such do not have a trilete mark. Furthermore the cupule is proximal (in relation to the associated spore) rather than distal.

***Fragilipollenites radiatus* Konyali in Agrali *et al.* emend.**

(Pl. 1, Figs 1–6, Pl. 2, Figs 1–3, 5.)

1965 *Fragilipollenites radiatus* Konyali in Agrali *et al.*, p. 180, pl. 16, fig. 24.

Original diagnosis. Konyali in Agrali *et al.* (1965, p.180): 'Pollen monosaccate à corps central arrondi (environ 40 microns) entouré par un sac lisse et transparent. Fins bourrelets méridiens. Branches de l'Y allant jusqu'à l'équateur du corps central. Taille: 120 à 150 microns.'

Emended diagnosis. Zonate and variably camerate miospores bearing a cuppa and an ornament of chordae which are radially disposed on the cuppa, proximal and distal surfaces of the exoexine and zona, and which radiate out from the centre of each contact face, dividing biserially.

Holotype. Agrali *et al.* (1965, pl. 16, fig. 24), re-illustrated in Plate 1, fig. 1. Single grain mount no. 488/8; collection of the Laboratoire Paléobotanique, Université des Sciences et Techniques de Lille.

Type locality. Borehole 41, 379.10 m. to 389.0 m; Amasra Coalfield, Turkey.

Age. Earliest Langsettian.

Description. Trilete, camerate, zonate miospores. Amb circular or rounded triangular; interradian margins convex

Explanation of Plate 1

Specimens of *Fragilipollenites radiatus* Konyali emend. All figures $\times 500$. References are for England Finder. **Fig. 1.** Holotype. Rephotographed from Agrali *et al.* (1965, pl. 16, fig. 24). **Fig. 2.** Specimen from core at 4317.5 m in North Sea well 44/23-9, slide 1, ML2215, ref. P66.4. **Fig. 3.** Specimen from core at 4317.5 m in North Sea well 44/23-9, slide 1, ML2215, ref. P67.3. Cuppa absent due to breakage. Note separation of paired chordae on the zona. **Fig. 4.** Specimen from core at 4317.5 m in North Sea well 44/23-9, slide 1, ML2215, ref. F54.3. Note *curvaturae perfectae* (cp). **Fig. 5.** Specimen from core at 4317.5 m in North Sea well 44/23-9, slide 2, ML2216, ref. F58.3. Focus on chorda (ch) along distal rim of cuppa. **Fig. 6.** Same specimen as Fig. 5. Focus on chordae on zona. Note *curvaturae perfectae* (cp).

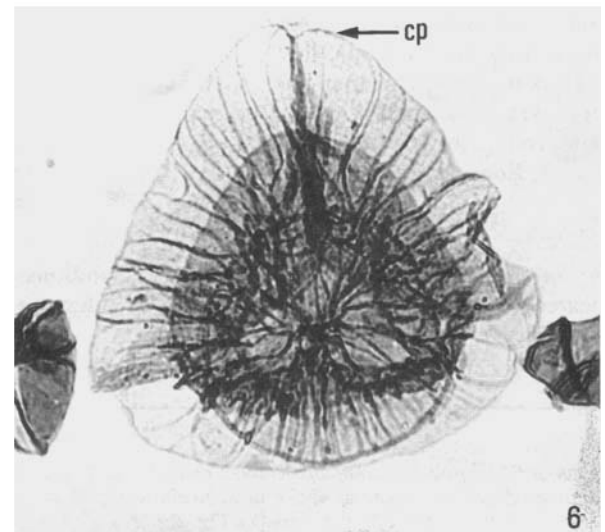
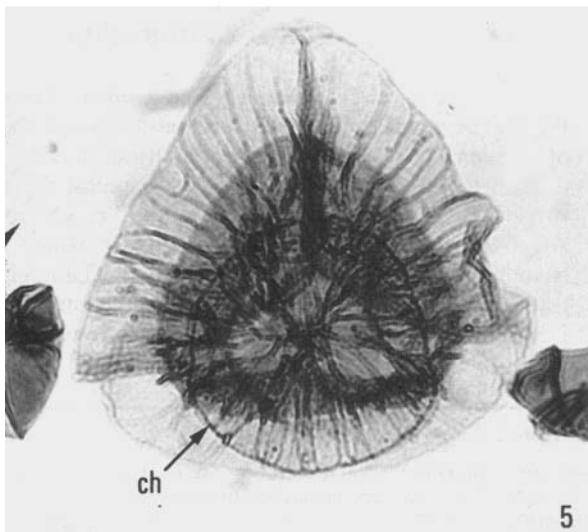
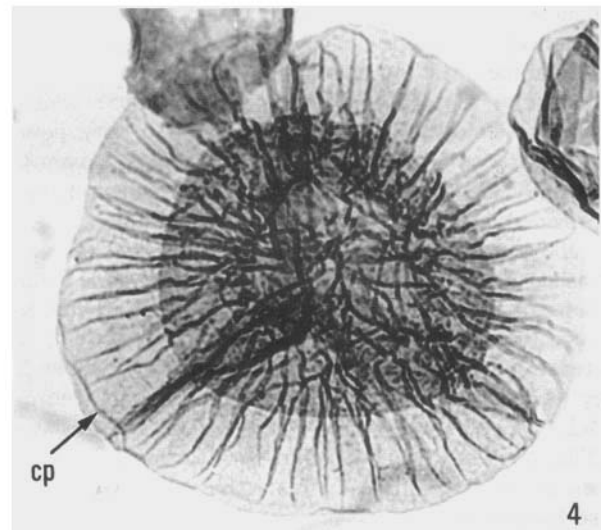
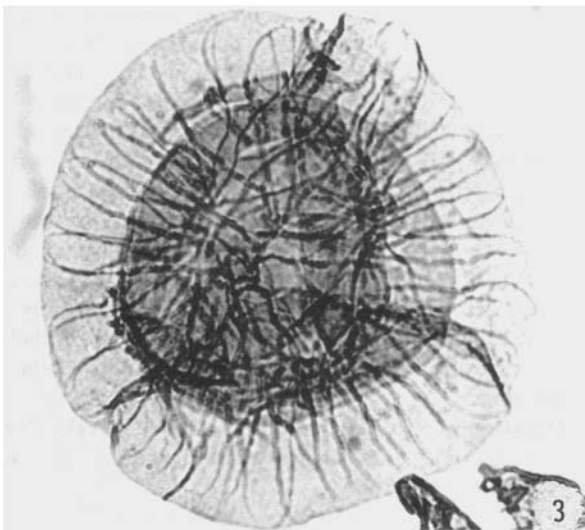
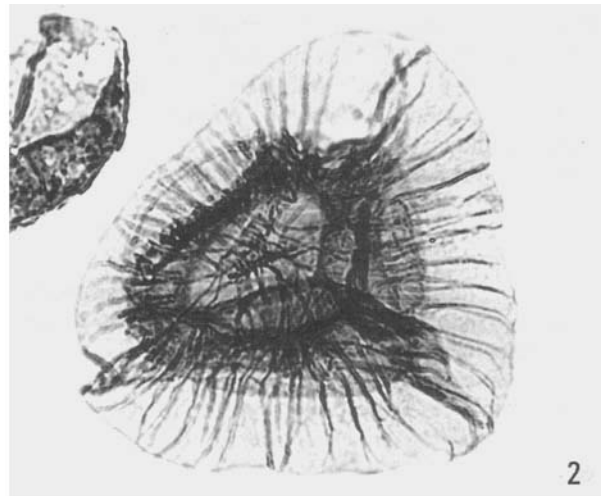
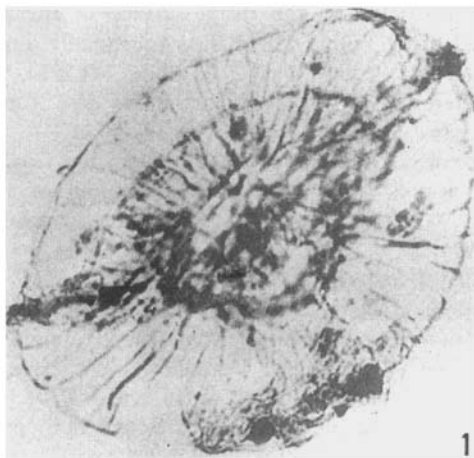


Plate 1

to more or less straight. Equatorial diameter 120(133)154 μm (22 specimens). Pronounced zona up to two thirds of the spore diameter. Exoexine and intexine attached proximally and distally but the proximal and distal membranes of the exoexine forming the zona may become separated to varying degrees to produce a camera. Equatorial outline of central body concave-rounded triangular, one third to one half of the total diameter of the spore. Distal surface bears a cuppa, 8–20 μm high, 20–30 μm wide at its base and 25–40 μm wide at its distal edge. Trilete rays accompanied by labra 8–15 μm high at the proximal pole, tapering to the equator, 1–2 μm wide. Equatorial *curvaturae perfectae* present though often difficult to discern. Sculpture of chordae up to 1 μm wide; chordae on contact faces radiate out from a more-or-less central point on each contact face, dividing biserially (Pl. 2, fig. 1, text-fig. 1a); distribution of chordae on the proximal and distal membranes of the zona similar, radially disposed, generally reaching the equator but often tapering and becoming indistinct before reaching the equator; chordae on the distal body and cuppa radially arranged, a single chorde runs around the distal rim of the cuppa.

Remarks. The material of Agrali *et al.* (1965) which provided the holotype of the species is in a very poor state of preservation (Stanislas Loboziak, pers. comm.). Consequently the illustration of the holotype (Plate 1, fig. 1) is provided by a photograph of the original plates.

The above synonymy list does not include reference to unpublished names from PhD theses. Many of these refer specimens of *F. radius* to the genus *Pteroretis* Felix & Burbridge 1961.

Occurrence. Earliest Langsettian; Amasra Coalfield, Turkey (Agrali *et al.*, 1965). Early Yeadonian; Stainmore, England (Bernard Owens, pers. comm.). Early Arnsbergian; Fife, Scotland (Keith Gueinn, pers. comm.). Earliest Langsettian and Yeadonian; Yorkshire, England, and earliest Langsettian; Derbyshire, England (Judith Lentini, pers. comm.). Arnsbergian and Langsettian; Brampton, England (John Williams, pers. comm.). Early Langsettian; Yorkshire, England (McLean, 1991). Late Langsettian to early Duckmantian; Quadrant 44, southern North Sea (Roger Neves, pers. comm.). Late Duckmantian; Quadrant 48, southern North Sea (this study). Late Kinderscoutian; Derbyshire, England (this study).

Fragilipollenites ganymedei sp. nov.
(Pl. 2, figs 4 and 6.)

Derivation of name. Named after Ganymede, handsome 'cup-bearer' to the gods of the Greek myths, in reference to the distinctive cuppa structure.

Diagnosis. Zonate, variably camerate miospores bearing a distal cuppa. Exine laevigate or microgranulate with chordae restricted to the distal surface of the miospore body and to the cuppa where they are radially arranged.

Holotype. Pl. 2, figs 4 and 6. Slide ML2214, England Finder reference L48.4; collection of the Centre for Palynological Studies, University of Sheffield.

Type locality. Mudstones beneath Ganister Coal, Lower Coal Measures; excavation at western end of old mine workings, Loxley Common, Sheffield, England (SK 3080,9097).

Age. Early Langsettian.

Description. Trilete, camerate, zonate miospores. Amb circular or rounded triangular; interrational margins convex to more or less straight. Diameter 140(152)164 μm (10 specimens). Pronounced zona up to one half of the spore diameter. Intexine and exoexine attached both proximally and distally. Proximal and distal exoexinal membranes forming the zona variably separated producing cameration. Central body concave to rounded triangular, one third to one half of the diameter. Distal face bears a cuppa, 8–20 μm high, 25–35 μm wide at its base and 25–46 μm wide at its distal end. Trilete rays accompanied by labra 8–15 μm high at the proximal pole, tapering to the equator, 1–2 μm wide. Proximal and distal surfaces of zona laevigate or microgranulate. Sculpture of chordae up to 1 μm wide, restricted to the distal surface of the miospore body and the cuppa, radially arranged with a single chorde running around the distal rim of the cuppa.

Comparison. *Fragilipollenites radius* is slightly smaller than *F. ganymedei* and bears a sculpture of chordae on the proximal and distal surfaces of the exoexine and of the zona.

Occurrence. Early Langsettian; South Yorkshire, England (this study). Late Langsettian; Quadrant 48, southern North Sea (this study).

STRATIGRAPHICAL AND GEOGRAPHICAL DISTRIBUTION

The stratigraphical distribution of the genus is illustrated in Fig. 2. The genus occurs rarely in mudstones and claystones of Silesian age. Because of the scarcity of specimens it is difficult to precisely delimit the stratigraphical range of its species. *F. radius* has a stratigraphical range from mid Arnsbergian to late Duckmantian. It is scarce in the Namurian and has its epibole through the Langsettian. *F. ganymedei* appears to be stratigraphically restricted to the Langsettian. Although originally recorded from coal (Agrali

Explanation of Plate 2

Specimens of *Fragilipollenites radius* Konyali emend. and *F. ganymedei* sp. nov. All figures $\times 500$. References are for England Finder. **Fig. 1.** *F. radius* specimen from core at 4317.5 m in North Sea well 44/23-9, slide 1, ML2215, ref. E55. Detached proximal membrane of exoexine with labra (l), contact faces (cf) and zona (z). **Fig. 2.** *F. radius* specimen from core at 4317.5 m in North Sea well 44/23-9, slide 2, ML2216, ref. S62.3. Broken specimen with preserved cuppa (c). **Fig. 3.** *F. radius* specimen from core at 4317.5 m in North Sea well 44/23-9, slide 2, ML2216, ref. P43. Equatorial view. **Fig. 4.** *F. ganymedei*. Holotype. Sample ML2214, ref. L48.4. Equatorial view, focus on microgranulate zona. **Fig. 5.** *F. radius* specimen from core at 4317.5 m in North Sea well 44/23-9, slide 2, ML2216, ref. M68.3. Equatorial view. Note absence of 'paired' chordae due to acamerate nature of the zona. **Fig. 6.** Same specimen as Fig. 4. Focus on cuppa.

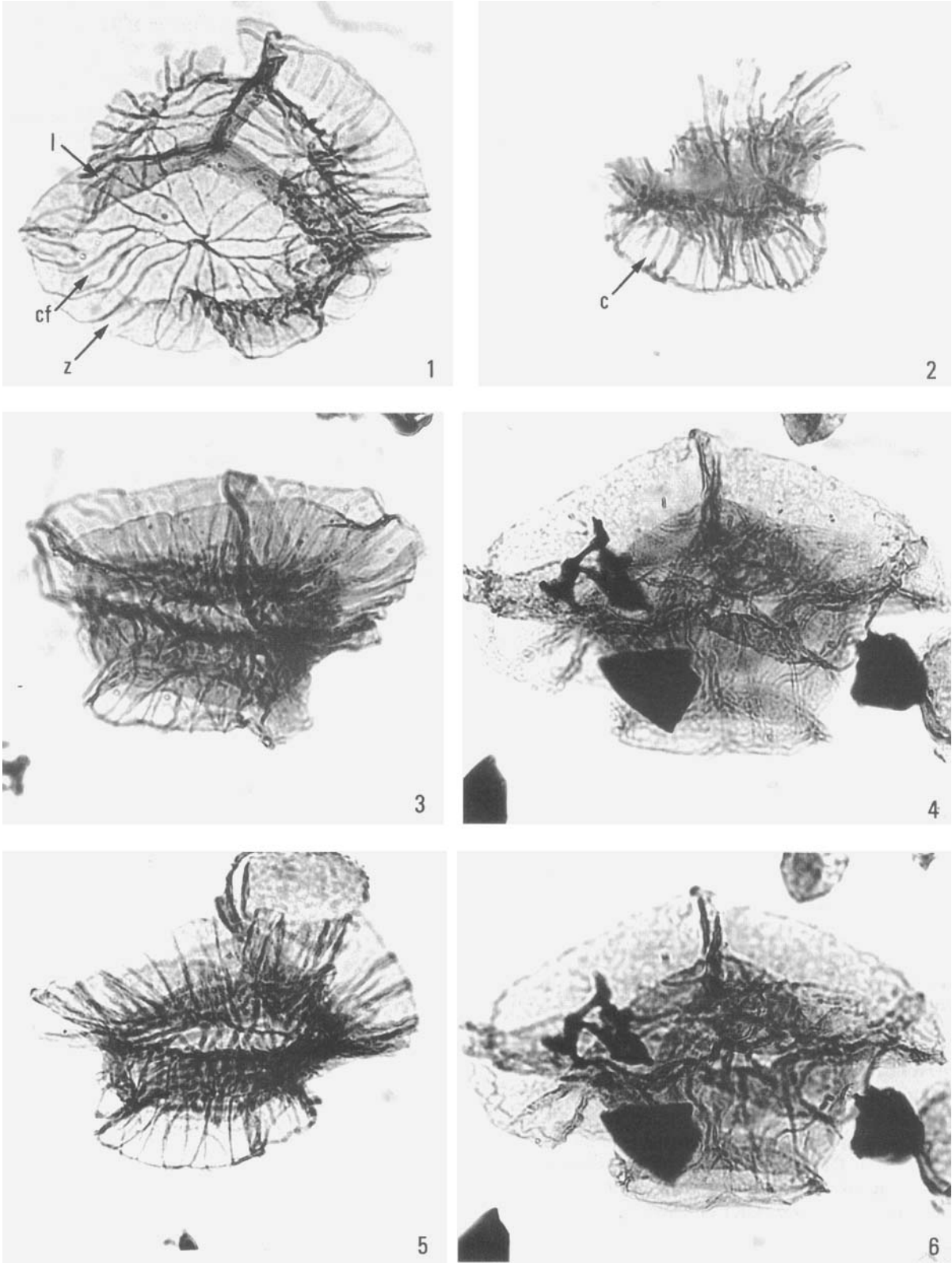


Plate 2

		<i>F. radiatus</i>	<i>F. ganymedeii</i>
		Fife Brampton North Derbyshire Stainmore Yorkshire Coalfield Derbyshire Coalfield Anatolia, Turkey North Sea Block 44/22 North Sea Block 44/23 North Sea Block 44/17 North Sea Block 48/10b	Yorkshire Coalfield North Sea Block 48/10b
WESTPHALIAN	Duckmantian		
	Langsettian		
	Yeadonian		
	Marsdenian		
	Kinderscoutian		
	Alportian		
	Chokierian		
	Arnsbergian		
	Pendleian		

Fig. 2. Stratigraphical records of occurrence of species of *Fragilipollenites* Konyali emend.

et al., 1965) the genus has not been recovered from coal seams in Northwest Europe. The apparent geographical restriction of the genus to onshore UK, the southern North Sea and Turkey probably reflects the scarcity of specimens due to the parent plant forming only a minor component of the Silesian flora, rather than a true distribution.

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