

## MICROPALAEONTOLOGY NOTEBOOK

***Senoniasphaera turonica* (Prössl, 1990 ex Prössl, 1992) comb. nov., senior synonym of *Senoniasphaera rotundata alveolata* Pearce *et al.*, 2003: an important dinocyst marker for the Lower Turonian chalk of NW Europe**MARTIN A. PEARCE<sup>1,\*</sup>, JOHN S. LIGNUM<sup>2,3</sup> & IAN JARVIS<sup>2</sup><sup>1</sup>Statoil 2103, CityWest Boulevard, Houston, Texas 77042, USA<sup>2</sup>School of Geography, Geology and the Environment, Centre for Earth and Environmental Science Research, Kingston University, Penrhyn Road, Kingston-upon-Thames KT1 2EE, UK<sup>3</sup>Ichron Limited, Century House, Gadbrook Business Centre, Northwich, Cheshire CW9 7TL, UK

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**INTRODUCTION**

The organic-walled dinoflagellate cyst *Craspedodinium* [sic] “*turonicum*” was described in German by Prössl (1990, pp. 108–109) from the Lower to Upper Turonian of the Konrad 101 borehole (NW Germany), translated here as:

Diagnosis: The cavate cyst consists of a thicker endophragm and a thinner ectophragm. A rough to fine-mesh reticulum on the inside of the ectophragm is partially connected to the endophragm by round or elongate columns. The outer side of the ectophragm is smooth, but partially folded.

Description: The ectophragm is to a large part separated from the inner body, particularly in the left lateral region. In the ventral and dorsal area, as well as at the antapex it is closely appressed to the endophragm, with the result that two antapical horns are often visible. The paracingulum is often marked by two narrow parallel sutures. The parasulcus appears mostly not reticulate. The reticulum itself consists of a ‘coarse-meshed’ part of first order; within the thickened parts, a fine-mesh part of second order is superimposed. Based on the absence of the apical operculum, the outline of 6 precingular plates becomes visible. The archaeopyle corresponds to the type tAtI following Helenes (1983).

The dinocyst became validly published on specifying a holotype in a succeeding paper (Prössl, 1992).

*Craspedodinium* was questionably placed in the Subfamily Ovoidinioideae (Order Peridinales) by Fensome *et al.* (1993), who considered that the archaeopyle is comprised of apical and intercalary paraplates. However, in the emended generic diagnosis of Riding & Helby (2001), a paratabulation formula of 4', 6'', Xc, 6''', ?1p, 1'''' precludes the presence of apical intercalary paraplates and indicates that the archaeopyle is entirely apical (not combination), as previously stated by Stover & Evitt (1978; and others, see Riding & Helby, 2001). Therefore, *Craspedodinium* should be classified under the Order Gonyaulacales.

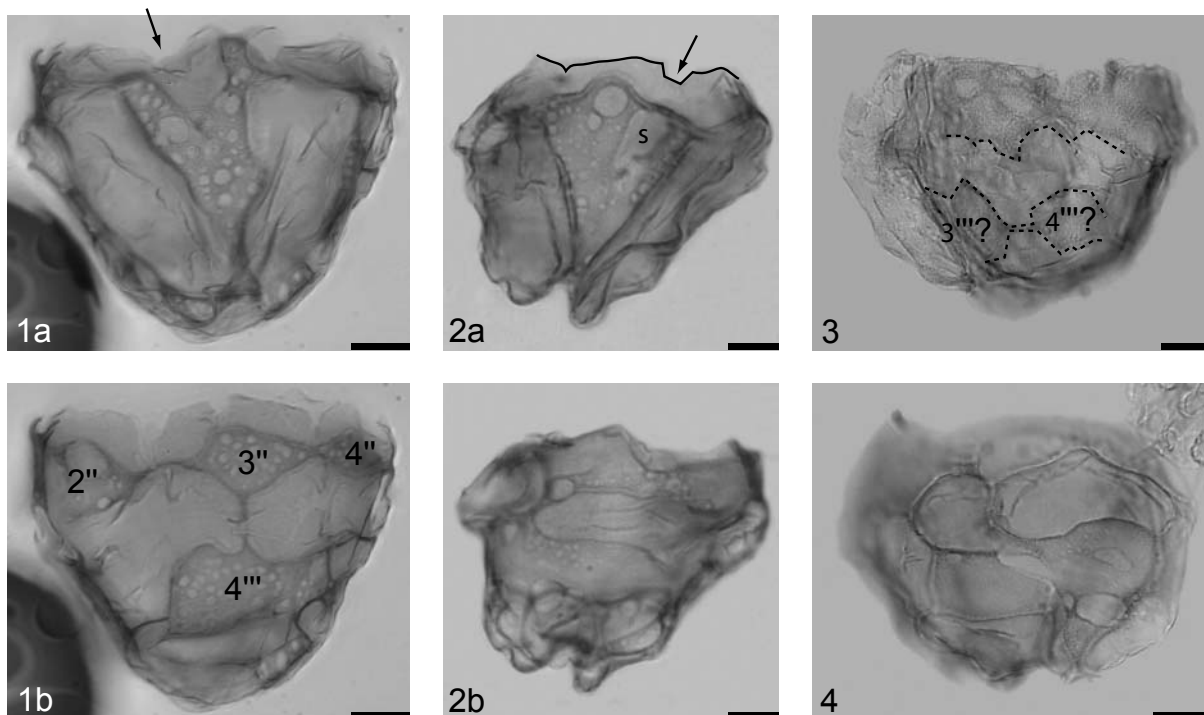
In their study of the Turonian and Coniacian chalks of southern England, Pearce *et al.* (2003) identified two distinct forms of *Senoniasphaera rotundata* that appear to be mutually exclusive, and described the subspecies *S. rotundata alveolata* (Pl. 1, fig. 1a, b) for the form common in the Turonian. The rationale for describing this form at sub-specific level was to retain the species name *S. rotundata* as a regional marker for the

Lower Turonian since the name was in popular usage (e.g. Robaszynski *et al.*, 1982; Jarvis *et al.*, 1988a,b; FitzPatrick, 1995; Tocher & Jarvis, 1995; Lamolda & Mao, 1999) and it is synonymous with a well-established Lower Turonian zone (e.g. Foucher, 1980, 1981).

*Senoniasphaera rotundata* was described by Clarke & Verdier (1967) from the Santonian of Culver Cliff (Isle of Wight); however, from its known range of Turonian to Maastrichtian, they recovered a very poor palynological record through the Turonian–Coniacian interval. The study by Pearce *et al.* (2003) was, therefore, particularly useful in showing that although rare and sporadic occurrences of *S. rotundata rotundata* (i.e. resembling the type species) occur in the lower Middle Turonian, they are significantly more consistent and common in the Coniacian.

Comparing the specimens of *S. rotundata alveolata* from the BGS Banterwick Barn borehole with the holotype of *C. turonicum*, there is little doubt that they represent the same species, with the latter as the senior synonym. The specimens of *S. rotundata alveolata* figured by Pearce *et al.* (2003, pl. II, figs 6–7; here Pl. 1, fig. 1a, b) and other specimens from the same section (here Pl. 1, figs 2–4) are morphologically highly variable, but all possess the zigzag apical archaeopyle, antapical horns and a thickened ectophragm with distinctive lumina that is broadly arranged horizontally and vertically on the dorsal and ventral surfaces, respectively. Both *S. rotundata alveolata* and *C. turonicum* also generally possess an inflated ectophragm (Pl. 1, fig. 3; but this is not a consistent feature), and critically have a lowest occurrence in the Lower Turonian and are particularly abundant in the Upper Turonian.

However, well-preserved specimens from Banterwick Barn also possess an offset parasulcal notch (Pl. 1, figs 1a, 2a) suggesting an areoligeracean affinity and the new combination of *Senoniasphaera turonica* comb. nov. is proposed. Unpublished work by J. S. Lignum on the palynology of the Cenomanian and Lower Turonian of England, France and Germany found either the first occurrence or the first common occurrence (Cenomanian occurrences are generally rare) of *S. turonica* comb. nov. in the Lower Turonian and, significantly, did not record *S. rotundata rotundata* (see also Pearce *et al.*, 2009). Other informal areoligeracean dinocysts of Turonian–Coniacian age with indications of the same ectophragm morphology have been illustrated (see synonymy list) and are suggested to be variations of *S. turonica* comb. nov. The first common occurrence of



#### Explanation of Plate 1.

*Senoniasphaera turonica* comb. nov. from the BGS Banterwick Barn borehole. **fig. 1.** as figured by Pearce *et al.* (2003, pl. II, figs 6–7; reprinted with permission from Elsevier): **a**, internal ventral view (reversed), arrow indicates the parasulcul notch; **b**, external dorsal view showing the thickened ectophragm outlining a standard gonyaulacacean patatabulation. **fig. 2a**, external ventral view, arrow indicates the parasulcul notch that is in line with longitudinal lumina, which appears to represent the parasulcus (s); **2b**, internal dorsal view (reversed). **fig. 3**, external dorsal view, showing the separation of the wall layers at the left lateral margin. **fig. 4**, external dorsal view showing the finely reticulate ectophragm together with large rounded lumina. Scale bar 10  $\mu$ m.

*S. turonica* comb. nov. is proposed here as a useful marker for the Lower Turonian in NW Europe.

#### SYSTEMATIC DESCRIPTION

See Fensome *et al.* (2008) for references.

Order **Gonyaulacales** Taylor, 1980  
Suborder **Gonyaulacineae** (Autonym)  
Family **Areoligeraceae** Evitt, 1963

Genus *Senoniasphaera* Clarke & Verdier, 1967

**Type species.** *Senoniasphaera protrusa* Clarke & Verdier, 1967: 61, pl. 14, fig. 8.

*Senoniasphaera turonica* (Prössl, 1990 ex Prössl, 1992) comb nov.  
(Pl. 1, figs 1–4)

1988 *Canningia* sp. A Marshall & Batten: 90, pl. 1, figs 1–2 (Lower Turonian; Germany).

1990 *Craspedinium* [sic] “*turonicum*” sp. nov. Prössl: 108–109, pl. 16, figs 1–2, 6–7 (Turonian; Germany).

1992 *Craspedodinium turonicum* Prössl, 1990 ex Prössl: 114. (Turonian, Germany).

1992 *Senoniasphaera?* sp. A Schiøler: 21, pl. 3, figs 1–8 (Turonian?–mid-Coniacian; Denmark).

1995 *Senoniasphaera* sp. A Fitzpatrick: 767–769, figs 9e, i (Turonian; England).

2003 *Senoniasphaera rotundata alveolata* subsp. nov. Pearce *et al.*: 301–302, pl. II, figs 6–7 (Turonian–Lower Coniacian; England).

2009 *Senoniasphaera rotundata alveolata* Pearce *et al.*, 2003; Pearce *et al.*: 230 (Lower Turonian; England).

**Type species.** *Craspedinium* [sic] *turonicum* Prössl, 1990: 108–109, pl. 16, figs 1–2, 6–7 ex Prössl, 1992: 114.

**Holotype.** *Craspedinium* [sic] *turonicum* Prössl, 1990, pl. 16, figs 1–2.

**Comments.** *Senoniasphaera turonica* differs from *S. rotundata* by possessing a distinctly thickened ectophragm that is ornamented on both ventral and dorsal surfaces. *Renidinium rigidum* Prince *et al.* differs in possessing pericoels that are limited to the ventral surface.

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