



## *Fetchamium prolixispinosum* gen. et comb. nov. (division Dinoflagellata)

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**Abstract.** *Oligosphaeridium* is a gonyaulacacean dinocyst lacking cingular processes and possessing a distinctive process centred on the antapical plate indicating a sexiform hyposomal tabulation. However, specimens referable to the description of *Oligosphaeridium prolixispinosum* Davey and Williams, 1966, although lacking cingular processes, are clearly not sexiform. As an additional complication, the holotype of *Oligosphaeridium prolixispinosum* possesses cingular processes. In this brief contribution, we describe the new genus *Fetchamium* to accommodate the new transfer *Fetchamium prolixispinosum* gen. et comb. nov. and provide a discussion and emended diagnosis of the species.

In the original description of *Oligosphaeridium prolixispinosum*, Davey and Williams (1966:76) noted that “there is no obvious antapical process, in fact 3 antapical processes usually seem to be present”. Unfortunately, the significance of different hyposomal plate tabulations was not understood at the time, and the species was tentatively (and understandably) placed in *Oligosphaeridium*. Davey and Williams (1966) also stated a lack of cingular processes (as the basis for their tentative attribution), but also noted that at least two specimens from the lower Cenomanian possess six cingular processes. This was interpreted as an originally “unstable” feature of the species. As an additional complication, the holotype specimen chosen by Davey and Williams (1966; Pl. 1, Fig. 4) clearly possesses cingular processes. This raises a number of issues:

1. The holotype of *Oligosphaeridium prolixispinosum* does not conform with the original description by possessing an incomplete number of cingular processes; therefore, an emended species description is required (see below).
2. Given the radially symmetrical distribution of the three posteriormost processes in the holotype of *Oligosphaeridium prolixispinosum*, the hyposomal tabulation is likely quinqueform (certainly not sexiform;

Fig. 1), as it is in *Hystrichosphaeridium*. Therefore, the previously mentioned specimens possessing six cingular processes should be attributed to *Hystrichosphaeridium bowerbankii* (Pl. 1, Fig. 2), which also possesses an elongate body, and processes that are virtually identical to *O. prolixispinosum*.

3. As *Oligosphaeridium prolixispinosum* belongs neither in *Oligosphaeridium* (by being quinqueform; Fig. 1) nor in *Hystrichosphaeridium* (by not possessing a complete set of cingular processes, if present at all, and having no more than four sulcal processes), there is currently no genus to which this species can be assigned.

This latter point requires further consideration since, despite the robust suprageneric classification of Fensome et al. (1993), dinocyst systematics at generic and specific level are fraught with inconsistencies due to an extensive reliance on aphyletic “form genera”. For example, the use of wall features such as ornamentation is used at the generic (*Tectatodinium* from *Pyxidinospis*), species (*Canningia*) and subspecies (*Spiniferites ramosus*) level to separate taxa. Significant variation in the shape of the central body is also known in the same species. For example, *Hystrichosphaeridium tubiferum* subsp. *tubiferum* has a spherical to sub-spherical central body according to the emended diagnosis of Davey

and Williams (1966), but a distinctly elongate central body in *Hystrichosphaeridium tubiferum* subsp. *ovale*. The presence or absence of cingular processes is also a feature of different taxonomic levels. For example, *Oligosphaeridium* differs from *Hystrichosphaeridium* in lacking cingular processes, whereas this criterion is used to separate different species of *Litosphaeridium* (see Lucas-Clarke, 2007). Significantly, two varieties of *Eatonicysta ursulae* have been documented with a variable number of cingular processes (Williams and Downie, 1966), which also appears to be the case with *Fetchamium prolixispinosum* gen. et comb. nov. *Eatonicysta ursulae* is usually observed lacking cingular processes; four cingular processes (i.e. an incomplete complement) may rarely be present.

The similar arrangement and morphology of the posteriormost processes of *Hystrichosphaeridium recurvatum* (sub-spherical central body; Pl. 1, Fig. 1), *Hystrichosphaeridium bowerbankii* (elongate central body; Pl. 1, Fig. 2) and *Oligosphaeridium prolixispinosum* (typically lacking cingular processes, but where an incomplete number may be present; Pl. 1, Figs. 3, 4) suggests that these species are closely related. It could be argued, therefore, that *H. bowerbankii* and *O. prolixispinosum* should be synonymised in favour of the former, which would also require a significant emendation of *Hystrichosphaeridium*. However, we consider a complete lack of cingular processes, and a reduced number of sulcal processes, to be the typical situation in *Oligosphaeridium prolixispinosum* as prescribed by its original description. Therefore, it seems more pragmatic to emend the description of *O. prolixispinosum* to include the rare forms with an incomplete number of cingular processes (i.e. the holotype), and transfer the species to a new genus.

It should be noted that the genus *Oligokolpoma* has been erected for species otherwise referable to *Hystrichokolpoma*, but which lack cingular processes (see Fensome et al., 2009). In this case, species with variable number of cingular processes are not known, so the distinction between these genera is clear. We consider a re-evaluation necessary for *Litosphaeridium* for the same reason. For taxonomic references please refer to Williams et al. (2017).

#### Systematic description

Division **Dinoflagellata** (Bütschli, 1885) Fensome et al., 1993.

Subdivision **Dinokaryota** Fensome et al., 1993.

Class **Dinophyceae** Pascher, 1914.

Subclass **Peridiniphyceae** Fensome et al., 1993.

Order **Gonyaulacales** Taylor, 1980.

Suborder **Goniodomineae** Fensome et al., 1993.

Family **Goniodomaceae** Lindemann, 1928.

Subfamily **Pyrodinioideae** Fensome et al., 1993.

Genus *Fetchamium* gen. nov.

**Type.** *Oligosphaeridium prolixispinosum* Davey and Williams, 1966, pl. 8, fig. 3; Pl. 1 fig. 4.

**Derivation of name.** From the name of the type area, Fetcham Mill (Surrey, UK).

**Diagnosis.** Goniodomacean dinoflagellate cysts, possessing an apical archaeopyle and hollow, tubular, mesotabular processes that reflect a quinqueform tabulation. Cingular processes are absent or occasionally present but do not form a complete set and sulcal processes do not exceed four (including the posterior sulcal).

**Description.** Goniodomacean chorate dinoflagellate cysts with a two-layered wall, composed of endophragm and periphragm that are detached where the periphragm forms the hollow processes, but which are appressed elsewhere. Processes are tubular and open distally, are mesotabular, and may be absent on the cingulum or be represented by an incomplete number (i.e. less than six). There can be one to four sulcal processes (including the posterior sulcal). Three processes are present at the antapex, representing a quinqueform hypocystal plate arrangement. The archaeopyle is apical, Type  $tA_{(1'-4')}$  and the operculum is detached.

**Remarks.** *Hystrichosphaeridium* is placed in the subfamily Pyrodinioideae; however, this must be considered questionable since the basis Fensome et al. (1993) used to justify inclusion of *Hystrichosphaeridium* in that subfamily (based on a drawing in Evitt, 1985) may be incorrect. Evitt's drawing was labelled *Hystrichosphaeridium* cf. *H. tubiferum* but described as having processes that merge "distally into a clearly polygonal unit of irregularly perforate ectophragm that extends without interruption over the process cavity". The processes in *Hystrichosphaeridium* are open distally and lack an ectophragm.

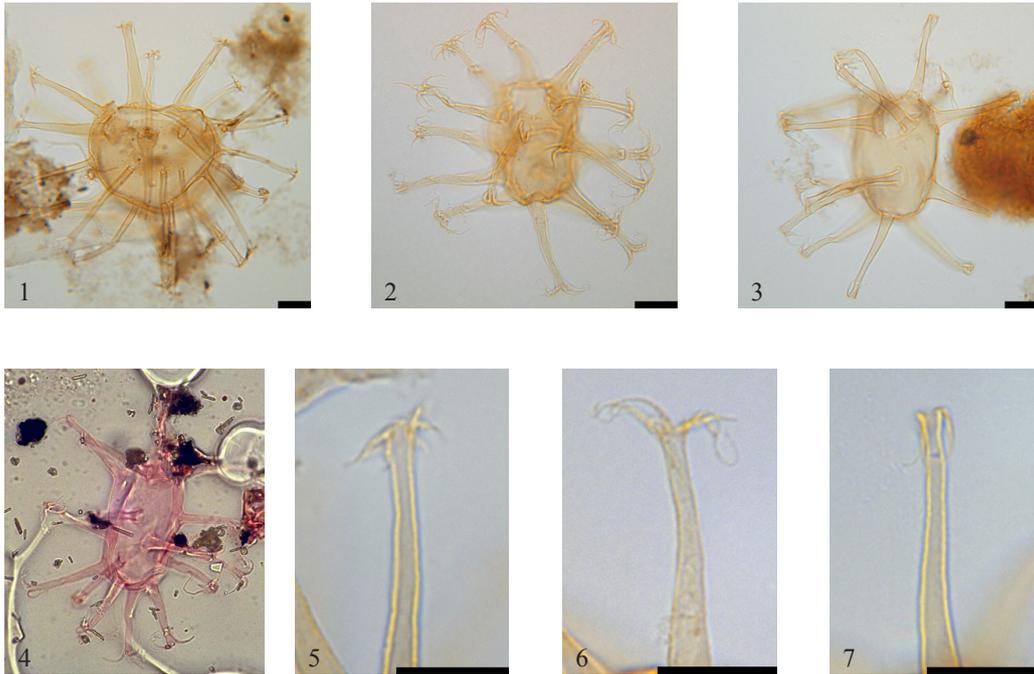
**Comparison.** *Fetchamium* differs from other pyrodinioideans, *Hystrichosphaeridium* and *Tanyosphaeridium* in lacking cingular processes or, if rarely present, by possessing a variable but incomplete number. *Homotryblium* and *Polysphaeridium* differ by possessing an epicystal archaeopyle. The leptodinioidean *Oligosphaeridium* differs in being sexiform.

*Fetchamium prolixispinosum* (Davey and Williams, 1966) comb. et emend. nov.

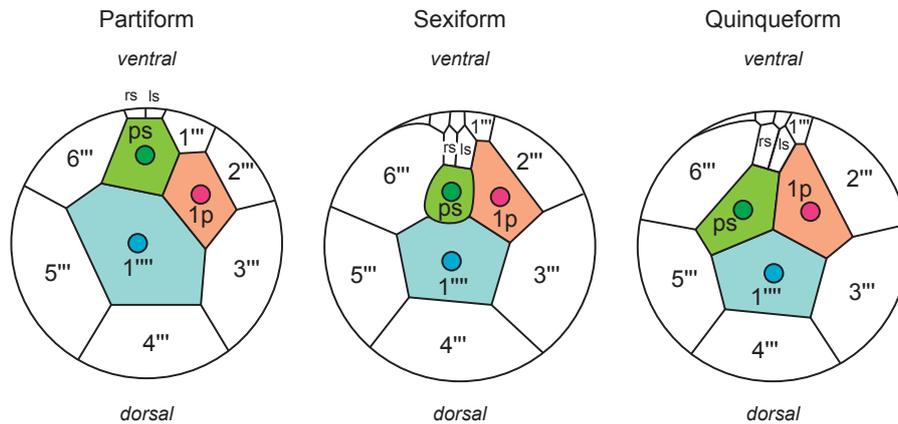
(Pl. 1, figs. 3–4, 7)

1966 *Oligosphaeridium prolixispinosum* Davey and Williams: 76–77, pl. 8, figs. 2–3.

**Holotype.** *Oligosphaeridium prolixispinosum* Davey and Williams, 1966, pl. 8, fig. 3; Pl. 1, Fig. 4.



**Plate 1.** (1, 5) *Hystrichosphaeridium recurvatum* (White, 1842) Lejeune-Carpentier, 1940: (1) external view; (5) detail of a process and process endings. (2, 6) *Hystrichosphaeridium bowerbankii* Davey and Williams, 1966: (2) external view, presumably of the dorsal surface; (6) detail of a process and process endings. (3–4, 7) *Fetchamium prolixispinosum* gen. et comb. nov.: (3) external view of the dorsal surface and quinqueform hyposomal tabulation; (4) holotype, showing the quinqueform hyposomal tabulation; (7) detail of a process and process endings. Scale bar represents 10  $\mu$ m.



**Figure 1.** Illustration of the hyposomal tabulation patterns of the Order Gonyaulacales using the Kofoid tabulation system. Partiform (suborder Cladopyxiineae), Sexiform (suborder Gonyaulacaceae), and Quinqueform (suborder Goniodomineae). Modified from Fensome et al., (1993).

**Emended diagnosis.** A species of *Fetchamium*, possessing an elongate central body. The wall is two-layered, composed of smooth endophragm and periphragm that separate to form hollow processes, but which are appressed elsewhere. The tabulation formula of  $4'$ ,  $6''$ ,  $0-4c$ ,  $6'''$ ,  $1p$ ,  $1-3s$  ( $ps$ ),  $1''''$  is defined by processes that are tubular and open distally, mesotabular, typically absent on the cingulum

or missing from some plates, and terminate in a number of fine thread-like spines. Three processes are present at the hypocyst, representing a quinqueform hypocystal plate arrangement. The archaeopyle is apical, Type  $ta_{(1'-4')}$  and the operculum is detached.

**Comparison.** *Fetchamium prolixispinosum* differs from *Hystrichosphaeridium bowerbankii* Davey and Williams, 1966 and *Hystrichosphaeridium recurvatum* (White, 1842) Lejeune-Carpentier, 1940 by typically lacking, or rarely possessing, an incomplete number of cingular processes, and further from the latter by possessing an elongated rather than sub-spherical central body.

**Data availability.** No data sets were used in this article.

**Competing interests.** The authors declare that they have no conflict of interest.

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