157. Palaeopontosphaera Noel (1965) emend. de Kaenel & Bergen (1993)

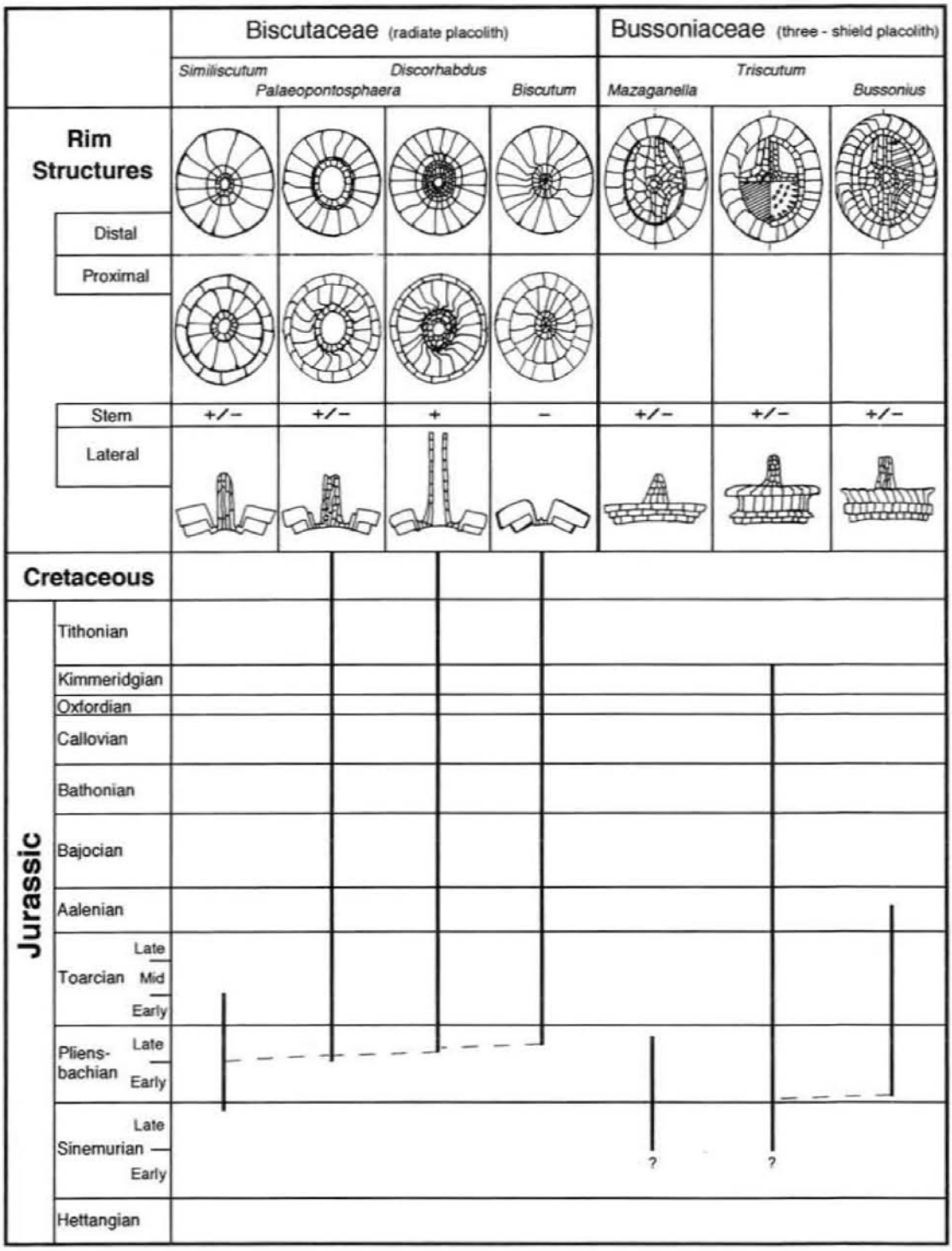

Figure 3. Overview of rim ultrastructure characteristics of genera in the Biscutaceae and Bussoniaceae, and their stratigraphic distribution.

Fig. 3

Type species. *Palaeopontosphaera dubia* NOEL 1965.

Previous emended diagnoses. 'Elliptical coccoliths, formed of two closely appressed discs;

central disc (slightly larger than the proximal disc) sloped in its center to allow the passage of a stem penetrated by an axial canal' (Noel 1973, p. 117).

'Elliptical coccoliths, composed of two closely appressed discs. The central area is very reduced with a stem attached at all points to the margin or well attached to the latter by buttresses' (Goy in Goy et al. 1979. p. 42).

Emended diagnosis. Circular to elliptical Biscutaceae possessing an inner wall constructed of non-imbricate elements. The central area is imperforate, vacant, or spanned by a simple structure (cross or bar).

Description. Circular to elliptical placoliths constructed of two broad shields: shield elements arc non-imbricated and have radial sutures. An inner distal cycle (wall) constructed of non-imbricated elements is present. The resulting birefringence pattern is bicyclic: the thin inner cycle is brightly birefringent and the broad outer cycle displays little or no birefringence. The central area may be imperforate, vacant, or spanned by a simple cross or transverse bar (no accessory bars are present). A distal stem or spine base may be present.

Discussion. The holotype of the type species is a badly etched coccosphere. Its coccoliths are elliptical, non-imbricate placoliths with high inner rim margins, but their central areas and inner rim structures (inner rim cycles) were not preserved. Subsequent descriptions and emendations of *Palaeopontosphaera dubia* (Noel 1973, Grün & Zweili 1980. Bown 1987b) characterized the species as an elliptical coccolith constructed of two shields with radial elements and a small, closed granular central area with a distal spine. Goy et al. (1979: Goy 1981) demonstrated that the stem was supported on the proximal surface by an axial cross which nearly filled the central area (the small openings are not visible from the distal surface). but illustrated specimens with more open central areas that belong to an undescribed species similar to *Palaeopontosphaera erismata* WIND & WISE (1977). Bown (1987b) first described the inner distal cycle of *Palaeopontosphaera dubia,* which is evident in numerous electron photomicrographs of the species. We consider this feature diagnostic of the genus *Palaeopontosphaera.* The emended diagnosis presented herein also allows for variation in coccolith outline and central area construction.

The original generic diagnosis misinterpreted its rim construction (classified as a discolith), but mentioned its elliptical outline and vertical rim elements. Noel (1973) recognized its elliptical, two shield rim construction when she emended the generic diagnosis, but also emphasized the presence of a distal stem. Goy (in Goy et.al. 1979) further restricted the generic diagnosis to include a small central area occupied by a distal stem, which was supported from beneath. Comparisons between the two species placed in *Palaeopontosphaera* by Goy (Goy et al. 1979: Goy 1981) demonstrate which morphologic

features he considered diagnostic of the genus. His *Palaeopontosphaera dubia* and *Palaeopontosphaera nova* are both non-imbricate placoliths with two broad shields, small central areas, and distal stems. However, the two species illustrated in Goy (1981) differ in outline, central area construction, and rim ultrastructure.

Other authors have recognized *Palaeopontosphaera* as a junior synonym of *Biscutum* BLACK (in Black & Barnes 1959). However, the holotype of the type species of *Biscutum* is nearly circular (3.7 x 3.6 μm) and has a different rim construction than *Palaeopontosphaera* (see discussion under *Biscutum).* The concept of *Biscutum* which has evolved in published studies of the Cretaceous is that of an elliptical genus. This more closely approximates *Biscutum castrorum* BLACK (in Black & Barnes 1959), which was described in the same publication as *Biscutum testudinarium.* Its holotype has 22 rim elements and it appears that its proximal shield elements extend into and close the central area: a distinct separate central cycle of elements is not evident in this specimen. Other electron photomicrographs of elliptical Biscutaceae recovered from the Upper Cretaceous (egs. Perch-Nielsen 1968, Bukry 1969) do not show any central cross structure or distal process, but do indicate the presence of an inner distal rim cycle as in *Palaeopontosphaera.* Specimens recovered from the Lower Cretaceous (egs. Black 1972, pl. 2: Grün & Allemann 1975, pl. 1, figs. 5-7) illustrate the transition from Jurassic forms with a central spine to the elliptical Upper Cretaceous Biscutaceae which do not have this central area feature. Grün & Allemann (1975) simply placed the large number of small elliptical Biscutaceae into synonymy as single species and assigned priority to *Biscutum* BLACK (in Black & Barnes 1959). Grün & Zweili (1980) later emended *Palaeopontosphaera dubia.* They distinguished it from the Cretaceous species *Biscutum ellipticum* (=*Biscutum testudinarium)* and *Biscutum castrorum* by its central spine. but still recognized *Biscutum* as a senior synonym of *Palaeopontosphaera.* However, *Palaeopontosphaera* should be retained as a separate genus from *Biscutum,* since the holotypes of their type species are unrelated; the elliptical Cretaceous Biscutaceae probably evolved from *Palaeopontosphaera dubia* and should be placed in that genus.

Differentiation. *Palaeopontosphaera* and *Similiscutum* both display bicyclic rim extinction patterns. The bright inner rim cycle *Palaeopontosphaera* results from its inner distal rim cycle, whereas that of *Similiscutum* results from its proximally extended inner margin (which may be a separate rim cycle).

Sollasites BLACK (1967) has a rim construction and extinction pattern similar to *Palaeopontosphaera,* but is distinguished by its complex central area construction. The oldest documented specimens of *Sollasites* are early Toarcian (older specimens with identical central area constructions have a *Calyculus* rim construction) and lack a well developed inner distal rim cycle.

Biscutum displays a unicyclic rim extinction pattern and lacks an inner distal rim cycle (wall).

Crucibiscutum JAKUBOWSKI (1986) was described for Lower Cretaceous placoliths with a distinct axial cross, but an imbricate rim. The similarities in rim construction, coccolith outline, and central structures indicate that these forms may be closely related to *Palaeopontosphaera.*

Palaeopontosphaera has a rim construction similar to a family of Mesozoic placoliths (Family Podorhabdaceae NOEL 1965 of most authors), which are distinguished by their narrow rims. Specimens with rim dimensions transitional between *Palaeopontosphaera* and the 'podorhabdids' do exist (see discussion of *Palaeopontosphaera intermedia).* In this case, the two groups can be distinguished by their rim birefringence patterns. *Palaeopontosphaera* displays a distinctly bicyclic rim extinction pattern with a smooth, bright inner rim cycle, whereas the 'podorhabdids' display less birefringence contrast across their rim cycles and have a distinctly beaded inner rim cycle.

de Kaenel, E. & Bergen, J.A., 1993. New Early and Middle Jurassic coccolith taxa and biostratigraphy from the eastern proto-Atlantic (Morocco, Portugal and DSDP Site 547B). *Eclogae Geologicae Helvetiae*, **86(3):** 861-907.