

13. *Biscutum* Black (1959) emend. de Kaenel & Bergen (1993)

		Biscutaceae (radiate placolith)				Bussoniaceae (three - shield placolith)		
		<i>Similiscutum</i> <i>Palaeopontosphaera</i>	<i>Discorhabdus</i>	<i>Biscutum</i>		<i>Mazaganella</i>	<i>Triscutum</i>	<i>Bussonius</i>
Rim Structures	Distal							
	Proximal							
	Stem	+/-	+/-	+	-	+/-	+/-	+/-
	Lateral							
Cretaceous								
Jurassic	Tithonian							
	Kimmeridgian							
	Oxfordian							
	Callovian							
	Bathonian							
	Bajocian							
	Aalenian							
	Late Toarcian							
	Mid Toarcian							
	Early Toarcian							
	Late Pliensbachian							
	Early Pliensbachian							
Late Sinemurian								
Early Sinemurian								
Hettangian								

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

Figure 3

Type species. *Biscutum testudinarium* BLACK in Black & Barnes 1959.

Taxonomic synonym. *Bidiscus* BUKRY 1969.

Original diagnosis: “Two circular, different sized concavo-convex discs standing upon each another. They surround a central hole, whose base is closed by a septum of granules” (Reinhardt 1966. p. 30).

Emended diagnosis: Circular to elliptical Biscutaceae constructed of two unicyclic shields which display a unicyclic rim extinction pattern. A central cycle of elements is sometime present in the central area. A distal stem is not present.

Description: Circular to elliptical placoliths composed of two, broad, unicyclic shields which are constructed of non-imbricate elements. Shield elements have radial sutures which may be straight or kinked. The slope of the inner rim margin varies. The imperforate (typically small) central area can be closed or surmounted by a cycle of elements separates from the rim. A distal stem is not present. In cross-polarized light, the shields are faintly birefringent and the rim extinction pattern is unicyclic. Specimens may become slightly more birefringent towards the inner margin where the shield thickness may increase.

Discussion: The original description of the genus (Black in Black & Barnes 1959, p. 325) is too general, including all imperforate coccoliths with more than one shield, all of which are closely moulded onto each other. Reinhardt (1966) provided the first diagnosis for *Biscutum* (see above), which essentially conformed with the nearly circular holotype (1.03 eccentricity) of its type species. However, Black (1972: p. 26) later provided his diagnosis for the genus, restricting the genus to Biscutaceae with broadly elliptical to nearly circular outlines and bilateral symmetry. Although this diagnosis distinguished *Biscutum* from two other Biscutaceae genera originally defined as having circular outlines (*Bidiscus* BUKRY 1969 and *Palaeopontosphaera* NOEL 1965), it is artificial and excludes the vast majority of forms which are truly circular or elliptical. We have instead placed emphasis on the rim ultrastructure because it is the key to understanding the early evolution of coccoliths (see Bown 1987b). For example, the holotypes of *Biscutum* and *Bidiscus* have identical rim constructions and similar central area structures, but can only be distinguished by the very slight difference in their outlines. The holotype of the type species of *Biscutum* is a proximal view of an incomplete specimen recovered from the upper Cenomanian. This specimen is nearly circular (3.7 x 3.6 μm) and is constructed of two, broad unicyclic shields, each possessing sixteen, non-imbricated elements with radial sutures. A separate horizontal cycle of eight (two are missing?) elements fill its small central area. The holotype of the type species of *Bidiscus* (*Bidiscus cruciatus* BUKRY 1969) is a distal view of a complete specimen recovered from the lower Santonian. This specimen is circular (3.4 μm) and is constructed of two, broad unicyclic shields, each possessing fifteen, non-imbricated elements with radial sutures. A separate horizontal cycle of four perpendicular elements surmounts its small central

area. *Bidiscus* BUKRY (1969. p. 26) was described as having two unicyclic shields of radial elements and a small central area with varied ornamentation. The slight difference in coccolith outline between the circular shields described for *Bidiscus* and the slightly subcircular holotype of *Biscutum testudinarium* is not considered significant enough to warrant generic separation. Thus, *Bidiscus* is a taxonomic junior synonym of *Biscutum*.

The diagnosis of *Biscutum* is emended herein to define its rim construction and allow for variation in coccolith outline and central area structures. For example, a variety of central area structures are observed in circular Biscutaceae species illustrated from the Upper Cretaceous (Reinhardt 1965, pl. 1, fig. 3; Bukry 1969, pl. 6, figs. 10-12; pl. 7, figs. 1-9) and the Albian (Black 1972, pl. 1, figs. 1-9). Most *Biscutum* species have circular to subcircular outlines, whereas elliptical outlines are rare (Bukry 1969, pl. 7, figs. 10-11; Perch-Nielsen 1973, pl. 1, figs. 4. 5). The same variation in outline exists within *Discorhabdus*, which is distinguished from *Biscutum* by its distal projection. Elliptical species previously classified within *Biscutum* that possess an inner distal cycle of elements are now considered to belong to *Palaeopontosphaera*. Numerous authors have considered *Palaeopontosphaera* to be a junior synonym of *Biscutum* (see discussion under *Palaeopontosphaera*). However, we believe that there is an important difference in their rim ultrastructures, representing two separate lineages within the Family Biscutaceae.

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.