

11. *Anthosphaera* Kamptner (1937) emend. Kleijne (1991)

Anthosphaera, Kamptner (1937), p. 303.

Helladosphaera, (in part) Gaarder (1962), pp. 47, 48.(in part) Norris (1984), p. 38.

Helladosphaera subg. *Cyclohelladosphaera*, Lecal (1967), p.326.

Calyptrolithina, (in part) Norris (1985), p. 625.

Diagnosis (emend.): Coccolith case dimorphic, coccoliths are holococcoliths. Ordinary coccoliths almost flat to cap-shaped (calyptroliths), with proximally a flat lateral rim of one crystal thickness. Proximal part of stomatal coccoliths (fragarioliths) similarly constructed, distal part drawn out in a large single-layered, leaf-like process.

Type species: *Anthosphaera fragaria* Kamptner, 1937, emend.

Remarks: Kamptner (1936, p. 245) mentioned the species *A. fragaria* in a summary, in anticipation of the results of an, at that time, unpublished study. In 1937 Kamptner described *Anthosphaera* and *A. fragaria* as new. *A. fragaria* was fixed as type species by monotypy.

A specimen of *Anthosphaera fragaria* had been studied with the electron microscope by Gaarder (1962) and appeared to have a dimorphic coccolith case consisting of holococcoliths. Gaarder (1962) mentioned the resemblance of the ordinary coccoliths to calyptroliths. Nevertheless she transferred *A. fragaria* to *Helladosphaera*, regarding both types of coccoliths as zygoliths. Kamptner (1937, 1941) already had mentioned the likeness to the genus *Helladosphaera*, but stated that the stomatal coccoliths have a simple leaf-like protrusion that can not be derived from zygoliths. He also drew attention to the resemblance of this species to *Calyptrosphera-species*, because of its calypthroform ordinary coccoliths, but concluded that it needed to be placed in the new genus *Anthosphaera*.

Halldal and Markali (1955, p. 17, pl. 21) showed that the coccosphere of another species, *Anthosphaera quadricornu* (Schiller) Halldal and Markali, is built of heterococcoliths. Therefore, Norris (1984) transferred all heterococcolith-bearing *Anthosphaera*-species to the heterococcolithophorid genus *Algirosphaera*. He placed the type species of the genus, the holococcolithophorid *Anthosphaera fragaria*, in the genus *Helladosphaera*, regarding *Anthosphaera* as a junior synonym of *Helladosphaera*. During this study, however, three species were found which more or less satisfy the description of the genus *Anthosphaera* by Kamptner (1937). Their ordinary coccoliths are hat-shaped structures with a flat lateral rim that can be considered as calyptroliths. Their stomatal coccoliths bear a simple, single-layered process instead of the double-layered process in helladoliths. The name "fragarioliths" is proposed for this new type of holococcolith. Species with the

combination of calyptroform ordinary and fragarioform stomatal holococcoliths are here placed in the genus *Anthosphaera*.

Lecal (1967) described a new species from the coastal waters of Israel, and placed it in the new subgenus *Cyclohelladosphaera* Lecal of *Helladosphaera*. This species, *H. (Cyclohelladosphaera) lafourcadii* Lecal, has a basic structure similar to *A. fragaria* and *A. periperforata* and is therefore transferred to the genus *Anthosphaera*. *Cyclohelladosphaera* being a junior synonym of *Anthosphaera*.

Kleijne, A., 1991. Holococcolithophorids from the Indian Ocean, Red Sea, Mediterranean Sea and North Atlantic Ocean. *Marine Micropaleontology*, **17**: 1-76.