Notes – *Notiser*

The presence of *Rhabdotetradium* (tabulate coral) in the Upper Ashgillian of the Oslo Region, Norway

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One specimen of *Rhabdotetradium frutex* Klaamann is described from the Upper Ashgillian of the Oslo Region. This is the first tetradiinaean coral recorded from Norway. The preservation of the fossil suggests an originally aragonitic skeletal composition. Comparisons with published descriptions and figures of tetradiinaean corals suggest that this group had the ability to secrete aragonite in contrast to all other early Palaeozoic corals.

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Despite all their extensive work on the coral fauna of the Oslo Region, none of the earlier workers reported the presence of tetradiinaean corals (Kiaer 1899, 1903, Scheffen 1933, Spjeldnaes 1964, Neuman 1969, 1975). The single specimen of *Rhabdotetradium frutex* found by the author in 1973 while studying the sediments and fauna of the Upper Ashgillian of the Ringerike area (50 km NW of Oslo) confirms their presence here, although as a very uncommon group.

Family CHAETETIDAE Milne-Edwards & Haime, 1850

Subfamily TETRADIINAE Nicholson, 1879

Genus *Rhabdotetradium* Sokolov, 1955

Type species. – *Rhabdotetradium nobile* Sokolov, 1955.

Diagnosis. – (Klaamann 1966): Different types of branching corallum. Corallites separated, long, flexible, prismatic, rounded-prismatic or, rarely, cylindrical. The number of corallites in the corallum is highly variable; single corallites can also be observed. The walls are thin with poorly developed epitheca. The septal development is characteristic for tetradiinaean corals and their degree of development in the different corallites varies according to their degree of maturity. Secondary septa are rarely seen since the young buds are at once separated from the original corallite. Tabulae are rare. (Translated from Russian).

Rhabdotetradium frutex Klaamann, 1966

Klaamann 1966:19, text-fig. 8, pl. XX, figs. 6–8.

Material. – One specimen, PMO 94083 a-1. This is stored in the type collection at Palaeontologisk museum, Oslo.

Horizon and locality. – Upper part of stage 5b (Upper Ashgillian), cliff section from the northern part of the outcrop at Stavnestangen, Ringerike.

Diagnosis. – Branching corallum. Corallites distinctly rounded, tetragonal, diameter 0.7–1.25 mm, arranged in irregular groups, short rows or even occurring singly. Thin walls. Always four distinct fan-shaped septa which occasionally reach the centre of the corallite. Secondary septa are rare. (Translated from Russian).

Description. – The corallum is at least 70 mm in diameter and 30 mm high. This is a minimum figure because the colony was clearly abraded before final deposition. The corallites are 0.8–1.0 mm in diameter and tend to be square in section with rounded edges. The growth form appears to be highly variable. Single corallites do occur, but

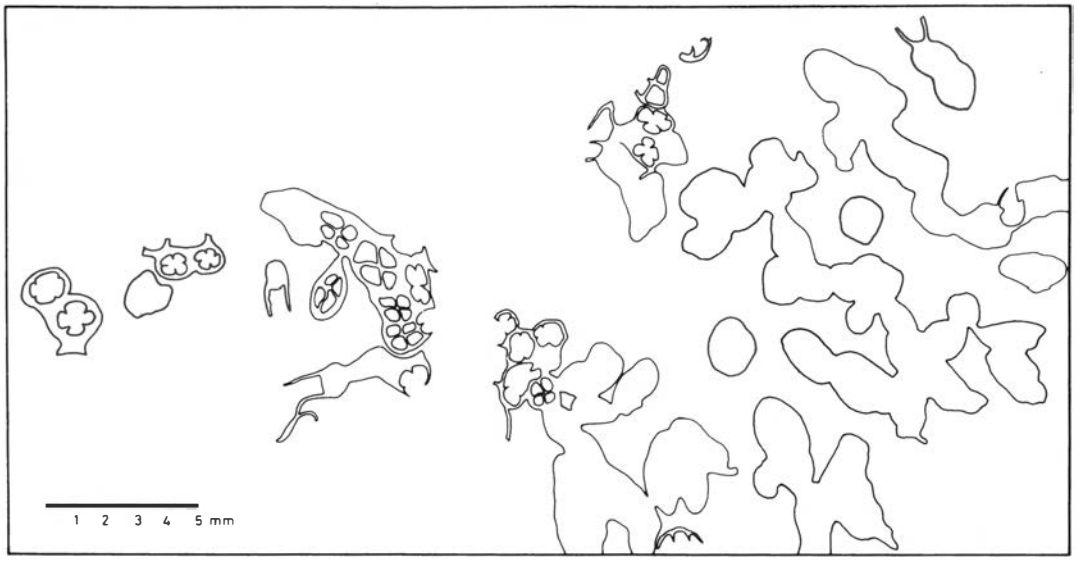

Fig. 1. Rhabdotetradium frutex Klaamann. Drawing of a transverse thin section showing the growth form of the colony. The inner structures are only seen where matrix has filled the corallites. PMO 94083 k.

mostly they are arranged in groups with up to 10–15 corallites involved (Fig. 1). The corallites in a single group are linked into small interconnected incomplete chains which surround sediment spaces (incomplete lacunae) of variable size.

The corallite wall is about 0.06–0.10 mm in thickness. The primary septa are slender and taper gradually towards the axis. No secondary septa have been observed. Where matrix has filled the corallites, the shape of the corallite, the thickness of the wall, and the presence of four septa can be observed. Most corallites, however, are preserved as sparry calcite filled tubes with no traces of inner corallite wall, septa or tabulae.

The wall of *R. frutex* is in thin section seen to have a strikingly different microstructure to that seen in other corals from the same locality and strata. All corals have well preserved primary microstructures, in contrast to *R. frutex* which is composed of coarse calcite crystals with markedly smaller crystals occurring near the wall surfaces (Fig. 2). The individual crystals mostly possess planar intercrystalline boundaries and show uniform extinction under crossed nicols.

Occurrence. – Upper Ordovician Porkuni Stage (F_{II}) of Estonia and Upper Ordovician Stage 5b, Ringerike, Norway.

Remarks. – Hill (1956) included the genus *Paleoalveolites* in the subfamily Tetradiinae, but this genus is not treated in this paper.

Bøggild (1930) described the same crystal fabric as that noted here in molluscs whose original aragonitic shell had been diagenetically replaced by calcite. This crystal fabric has been termed para-axial drusy mosaic (Bathurst 1964), and has been taken as evidence of dissolution of the original shell followed by infilling of the void by secondary calcite at a later diagenetic stage.

The original microstructure can usually be distinguished in early Palaeozoic corals, and it has been tacitly assumed that calcite was the sole carbonate mineral secreted by these animals. The primary microstructure of tetradiinaean corals has, however, never been demonstrated although the replacement by secondary calcite has often been mentioned (Troedsson 1929, Bassler 1950, Hill 1957). Published figures often show the crystal mosaic composition of the skeleton (Lindstrøm 1899, Holtedahl 1918, Webby & Semeniuk 1970).

All these observations on the crystal fabric in the tetradiinaean skeleton indicate an originally aragonitic composition diagenetically replaced by calcite, and Semeniuk (1971) actually produced evidence of an aragonitic composition of two species of *Tetradium* in the Bowan Park Group of New South Wales. One may deduce

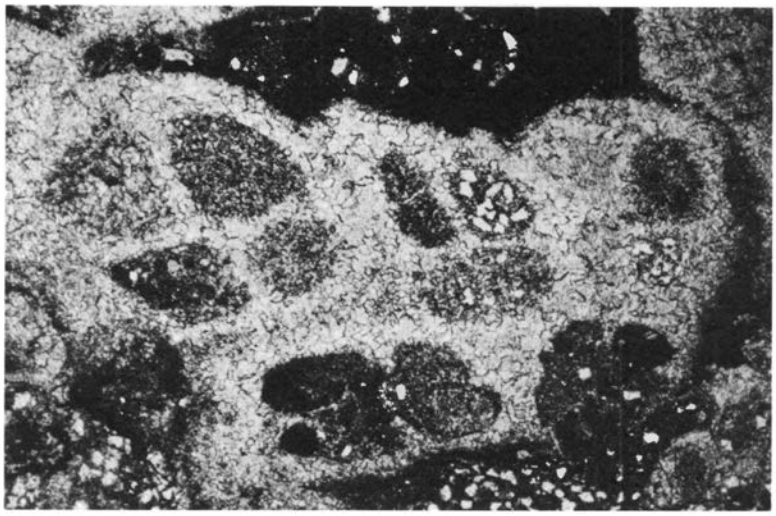

Fig. 2. Rhabdotetradium frutex Klaamann. Transverse thin section showing the crystal fabric of the corallum. 36 ×. PMO 94083 k.

from this that all the tetradiinaean corals were probably composed of aragonite.

The tetradiinaean corals are characterized by four septa arranged crosswise. This peculiar structure of the septal apparatus differentiates the group from all other Anthozoa. These features have given rise to different views of the systematics of the group (Sokolov 1950, 1955, 1962). Bondarenko (1966) regarded the tetradiinaean corals as an independent group of the subclass Anthozoa. The aragonitic composition of the skeleton will obviously be of taxonomic importance. The difference in mineralogical composition between tetradiinaean corals and all other early Palaeozoic corals therefore seems to support Bondarenko (1966) in regarding the tetradiinaean corals as an independent group of the subclass Anthozoa.

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