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Artikel: The Upper Jurassic coccoliths from the Haddenham and Gamlingay boreholes (Cambridgeshire, England)

Kapitel: Biostratigraphy and conclusions

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Loxolithus sp.

1965a *Loxolithus* sp. NOËL, p. 3.
1965b *Loxolithus* sp.: NOËL, p. 66.
1971 *Loxolithus* sp.: MEDD, p. 826, Pl. iv, Fig. 1.

Remarks. - This rare form has been seen in the optical microscope investigation of material from the Upper Oxford Clay of the Gamlingay Borehole at 60 feet (18.29 m). The generic assignation is provisional only.

Genus *Tetralithus* GARDET 1955

Type species: by monotypy; *Tetralithus pyramidus* GARDET 1955; Miocene, Algeria.

Remarks. - PARKE (1971, p. 929) discusses the life histories of several haptophycean coccolithophorids and concludes that "calcareous elements, sometimes identical with the fossil genus *Tetralithus* are deposited in the mucilaginous matrix surrounding the benthic phase in the majority of the genera".

Tetralithus gothicus DEFLANDRE 1959

1959 *Tetralithus gothicus* DEFLANDRE, p. 138, Pl. iii, Fig. 25.

Remarks. - This species has been recovered from most of the borehole samples examined. STRADNER & PAPP (1961) have also recorded it from the Palaeocene. K. Perch-Nielsen (pers. commun.) does not accept that these Jurassic forms should be assigned to *T. gothicus*, as this species should evolve in the Upper Cretaceous. However, the forms do consist of four hemi-scalenohedral crystals interlocking to a common centre with "peg-like" dovetailing (see MEDD 1971, Pl. ii, Fig. 3), and the writer considers that *T. gothicus* is available for these coccoliths.

Biostratigraphy and conclusions

The Jurassic zonal schemes published by BARNARD & HAY (1975) and THIERSTEIN (1976) need revising since many of the index species found in the three boreholes have biostratigraphical ranges outside of their zonal limits. Revised zonations of the Middle and Upper Jurassic strata and of the Jurassic/Cretaceous boundary, together with analysis of this previous work, are the subjects of separate future papers.

A comparison of the species occurrences (as given in Tables 2-4) with the total known ranges (given in the Appendix) provides some indication as to the usefulness of those species cited by the above two authors.

A summary of that part of the coccolith biostratigraphy for the interval covered by the three boreholes, which will be published in the future paper, gives the Callovian/Oxfordian boundary coinciding with the coccolith *Podorhabdus rahla / Stephanolithion bigoti maximum* zones boundary. This latter zone continues up to the ammonite *tenuiserratum* Zone of the Oxfordian, when it, in turn, is replaced by the coccolith *Actinozygus geometricus* Zone. This latter zone continues to the top of the three boreholes studied (Kimmeridgian, ammonite *eudoxus* Zone). A further stratigraphical breakdown of this interval, based on the stradnerliths, has not been successful to date, either due to their small size (i.e. the specimens have been overlooked), or because the stratigraphically restricted forms are too rare to be of zonal use. However, the proposed nannofossil zonation, which is at present little better than that of the ammonite stage, is still provisional and must await the future development of sample examination techniques (e.g. laser microscopy). This will lead to a greater accuracy and confidence of species location and identification, and the coccolith zones will be as refined as their ammonite counterparts.

Computer generation of dendrogram displays of similarity matrices of "distance" or "correlation" coefficients of selected coccolith species together with their locations in the boreholes is another method of objectively assessing the biostratigraphic potential of these species. A summary of this method can be found in any textbook concerned with the analysis of multivariate data and most computers can run the relevant programmes. Runs of "raw" sample data give a very tenuous positive result, whatever species are chosen. However, if the sample data are "lumped" together into their ammonite zonal equivalents, and the species used in the matrix analysis are restricted to podorhabdids, staurorhabdids or stradnerlithids/stephanolithids, then the degree of correlation is much higher and can be "most significant" (e.g. the staurorhabdids of the Gamlingay Borehole "lumped" data). This analytical work is still in its infancy and again depends on an accurate and quantitative examination of the samples. It is considered that it will be a very useful biostratigraphical/palaeoecological tool of future coccolith work.

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