Introduction

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

By ALAN W. MEDD[1])

ABSTRACT

The coccoliths of the Upper Jurassic rocks recovered from the Haddenham and the Gamlingay cored boreholes are described and illustrated. They include four new genera, eighteen new species, three new subspecies and one new name. The stratigraphical distribution of these beds based on coccoliths is also given in terms of the ammonite zones.

RÉSUMÉ

Les coccolithes d'âge jurassique supérieur recueillis dans des carottes de deux sondages près de Haddenham et de Gamlingay sont décrits et présentés par des photographies faites au microscope à balayage et par des dessin schématiques. Ils comprennent quatre nouveaux genres, dix-huit nouvelles espèces, trois nouvelles sous-espèces et un nouveau nom. L'extension stratigraphique de ces couches, basée sur l'étude des coccolithes, est également corrélée avec des zones d'ammonites.

CONTENTS

Introduction

Most of the Upper Jurassic coccolith material examined from surface localities in NW Europe has been described in previous papers by NOËL (1957, 1965, 1973), MEDD (1971), ROOD, HAY & BARNARD (1971) and ROOD & BARNARD (1972). The results of a preliminary examination of the cored Ampthill Borehole [NGR TL 0244 3804] drilled near Bedford in 1969 by the Institute of Geological Sciences was also given in MEDD (1971).

It was considered that much more information could be obtained with some stratigraphical interpolation if further Upper Jurassic borehole material was obtained from this area. This paper is primarily based on the coccoliths recovered from

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two further cored boreholes drilled at Gamlingay [TL 2320 5204] and at Haddenham [TL 4662 7554], both in Cambridgeshire. Figure 1 illustrates the position of these localities. Summary of these boreholes, based on the work carried out by Mr. A. Horton, has been published by the Institute of Geological Sciences (1970, p. 103; Table 1). A provisional graphic ammonite zonation for these boreholes is given in Figure 2. Samples from the section at Millbrook, near Ampthill [TL 0100 3820], described by ROOD, HAY & BARNARD (1971, p. 246), have also been collected and examined for their microfossil content; some of this material is mentioned in the text below.

The coccoliths recovered from these boreholes are compared with those already examined and described by the above mentioned and other authors. There is found to be a considerable variation in the numbers of coccolith species within the area bounded by the three boreholes, and several species additional to those already recorded from the Ampthill Borehole have been noted; the most prolific sample in numbers of species now yields thirty-four coccolith species. More than fifty coccolith species have been found in the Gamlingay Borehole sample at a depth of 68 feet (20.73 m). This invalidates the earlier comment (MEDD 1971, p. 821), that "the French rocks contain more varied nannofloral assemblages than do the English from similar stratigraphical levels", together with the conclusions derived from this

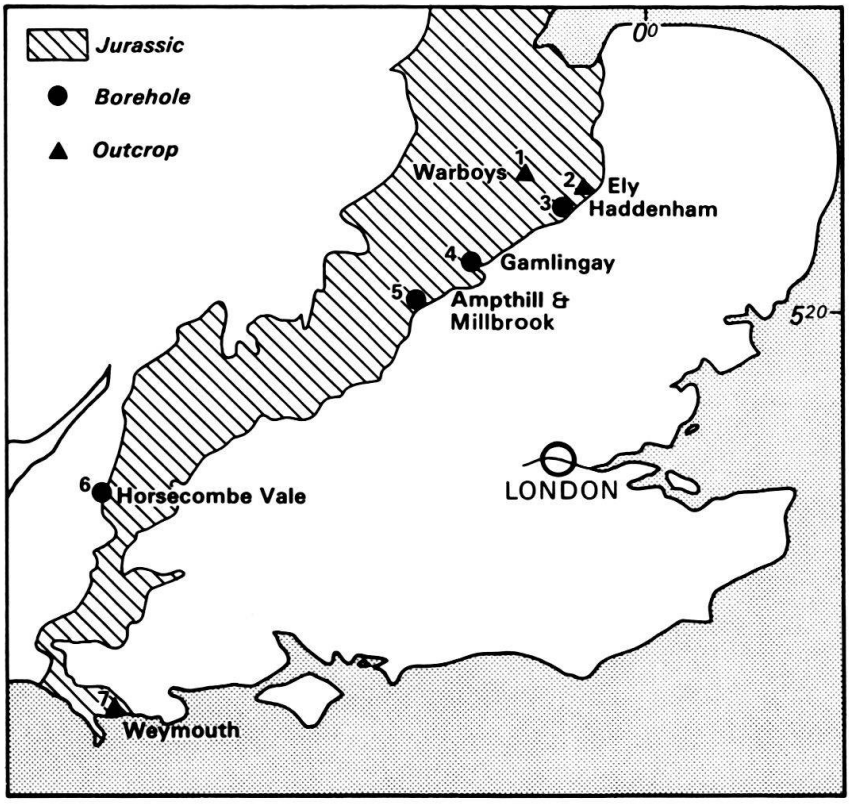

Fig. 1. Localities mentioned in the text.

1 = London Brick Company, brickpit at Warboys, Cambridgeshire; *2* = Great Ouse River Board pit at Ely, Cambridgeshire; *3* = Haddenham Borehole, Haddenham, Cambridgeshire; *4* = Gamlingay Borehole, Gamlingay, Cambridgeshire; *5* = Ampthill Borehole and Millbrook section, Ampthill, Bedfordshire; *6* = Horsecombe Vale 15 Borehole, Horsecombe Vale, Avon; *7* = Cliff near Weymouth, Dorset.

Table 1: *Lithostratigraphy of the Ampthill, Gamlingay and Haddenham boreholes.*

This is a resume of the sediments found in the three boreholes. No single borehole contains all of the sediment types; the absences are indicated in the table.

GROUP/FORMATION with lithology — BOREHOLE: in m	AMPTHILL		GAMLINGAY		HADDENHAM	
	thickness	depth	thickness	depth	thickness	depth
LOWER GREENSAND (WOBURN SANDS)						
Sands, soft pale-brown	10.16	10.16	4.17	4.17	11.54	11.54
Sand, coarse pale green	0.67	10.82	-	-	-	-
KIMMERIDGE CLAY						
Mudstones with piped beds	-	-	-	-	12.24	23.77
Mudstones with rare limestones	-	-	-	-	9.63	33.41
AMPTHILL CLAY						
Mudstones, grey and fawn	14.43	25.25	-	-	-	-
Mudstones and argillaceous limestones with carbonaceous material	6.45	31.70	-	-	-	-
Mudstones with thin limestones	-	-	10.21	14.39	32.84	66.14
ELSWORTH ROCK GROUP						
Mudstones and limestones with Exogyra	3.66	35.36	4.75	19.13	-	-
Mudstones and a thin limestone	-	-	-	-	1.34	67.57
OXFORD CLAY						
Mudstones and siltstones	27.43	62.79 TD	20.34	39.47	9.68	77.24 TD
lamberti Limestone	-	-	0.30	39.78	-	-
Mudstones and siltstones	-	-	4.24	44.01 TD	-	-

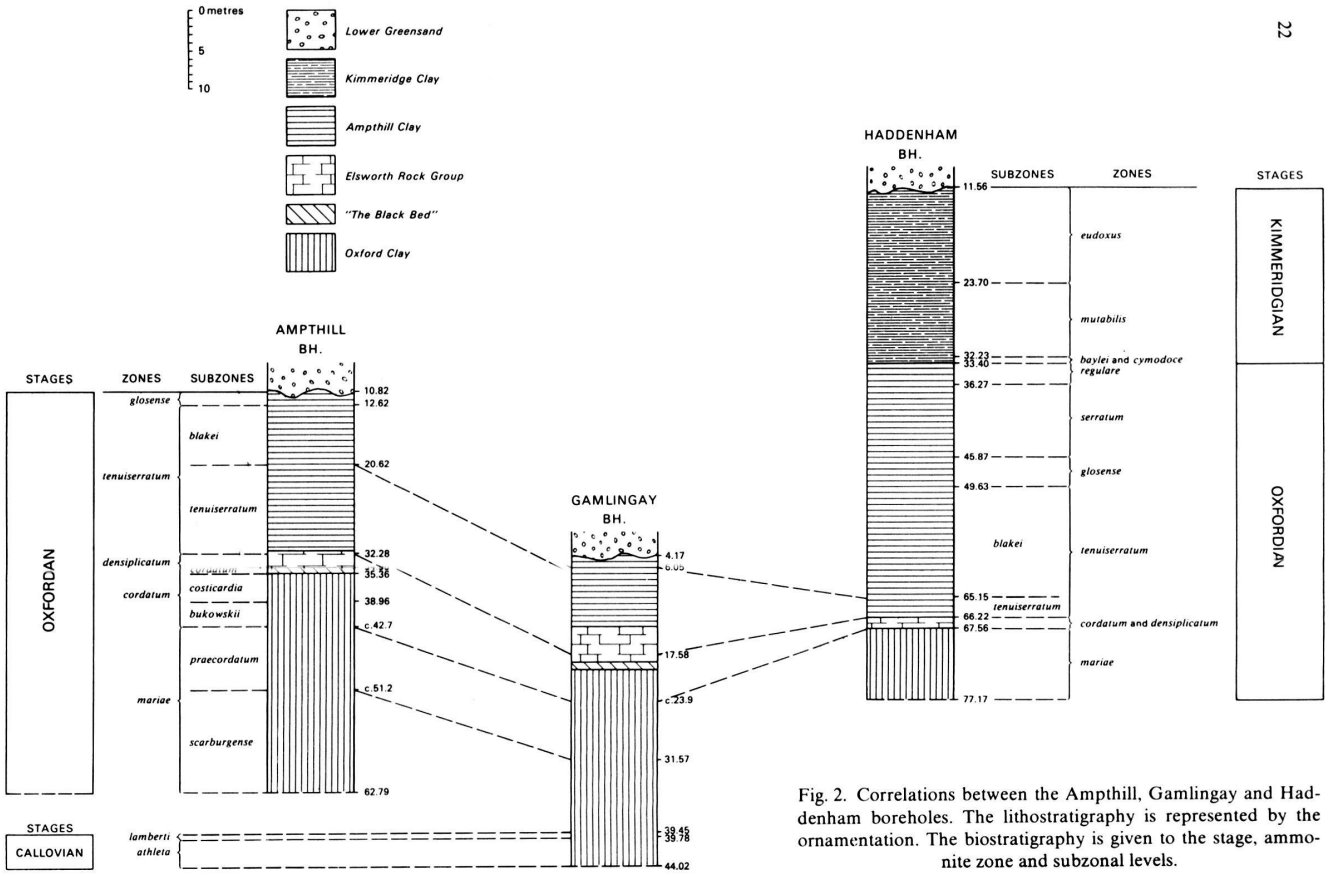

Fig. 2. Correlations between the Ampthill, Gamlingay and Haddenham boreholes. The lithostratigraphy is represented by the ornamentation. The biostratigraphy is given to the stage, ammonite zone and subzonal levels.

assumption. The number of specimens also varies within the stratigraphical interval studied; there is an increase in such numbers in the lower part of the Kimmeridge Clay, to a maximum number per unit mass of rock found for the whole of the Jurassic.

The methods of study are as stated in MEDD (1971) but a Zeiss photomicroscope II has been used for the routine optical investigations. The Nomarski interference phase contrast accessory is occasionally of help in the study of coccoliths. A TV fast scanning accessory on the scanning electron microscope has also proved to be of value for a detailed study of coccolith strew mounts; the instrument used is a Cambridge Instruments Co. Stereoscan Mark 2A, which is located at the Institute of Geological Sciences, London. The technique of NOËL (1973, p. 98) in examining the rock surface with an SEM has also been used but without her remarkable successes. Other Kimmeridgian samples examined, however, have provided excellent results, with abundant assemblages and coccospheres seen.

The problem of sample contamination is considerably diminished using borehole material and none of the problems associated with surface collected material (MEDD 1971, p. 823) was encountered. The problem of reworking of older coccoliths into the younger nannofloras has not been overcome as to its recognition, as opposed to these species having an extended range. It is difficult to envisage a method of erosion of the older sediments, which would preserve the coccoliths in such numbers as have been found at some levels in these boreholes. The relative proportions of the species are also different from that encountered in the older material. These suspect species appear most often in samples, which are already rich in numbers of indigenous species (i.e., not found in older sediments).

Figured or cited material prefixed with the letters "EM" are of micrographs taken with a Philips 75B transmission electron microscope at the Sedimentology Research Laboratory, University of Reading, and the material is lodged at that laboratory. If prefixed with the letters "SEM", the material was examined using the scanning electron microscope at IGS, London, where the material is now housed. If prefixed by the letters "MPK", the optical strew slides are stored in the MPK collection of type and figured specimens at the Institute of Geological Sciences, Leeds.

Details of the assemblages

The dominant species in all of the samples studied is *Ellipsagelosphaera britannica* (STRADNER) and particularly the small form of it. The only other species found, which occasionally constitute more than 25% of the nannoflora are: *Tetralithus gothicus* DEFLANDRE, *Palaeopontosphaera dubia* NOËL, *Zeugrhabdotus erectus* (DEFLANDRE) and small tremalith-like forms. The remainder of the species recorded can be found in varying degrees of abundance, but with no single species comprising more than 10% of the nannoflora.

Stratigraphical distribution

The distribution of the nannoflora of the Haddenham and Gamlingay boreholes are summarized in Tables 2 and 3, which record the species in the order of their