Jurassic hazards to coral growth

SIR – The only period when substantial coral growth occurred in Britain after the Palaeozoic was at the beginning of the Upper Jurassic, during the Upper Oxfordian (Corallian). Small coral patches are found along much of the outcrop in England and the geology of the coral-bearing units has been studied by Arkell (1928, 1933, 1935) and other authors. At Shellingford Cross Roads Quarry (Nat. Grid Ref. SU 327941, Fig. 1) coral growth was interrupted by penecontemporaneous erosion and smothering and influxes of clay of volcanic origin.

The coralliferous unit at Shellingford is lenticular, up to 2 m thick, and formed principally of autochthonous branching *Thecosmilia* associated with massive *Thamnasteria* and *Isastrea*. The lower part comprises branching colonies whilst the upper is mainly of massive corals. Growth of *Thecosmilia* was intermittently and locally interrupted at three main levels by deposition of discrete biosparite lenses, and by muddy sedimentation which smothered the calices. The mud occurs as lenses, 0–6 cm thick, now composed of about 60–70 % clay together with some silt and sand-sized quartz grains, coral and shell debris.

The mineralogy of the clay from these seams was determined by X-ray diffraction using nickel-filtered Cu–Kα radiation at 35 kV/55 mA. The $< 2\,\mu$m fractions were separated by sedimentation after disaggregation of the original samples, and mounted on ceramic tiles by vacuum filtration. Identification of clay mineral phases involved the standard pretreatment of glycollation and heating to 400 °C.

Semi-quantitative estimates of the relative amounts of clay minerals were calculated using the glycollated X-ray trace, and an expression of the ratio of smectite to illite was obtained by comparing the area of the 17 Å peak to that of the 10 Å peak. The results of these analyses show that smectite is dominant over subsidiary illite. Samples from the clays associated with corals from Shellingford and elsewhere in Oxfordshire, Yorkshire, and in the Cambridge area indicate a smectite content of about 88–98 % and 2–12 % illite and up to 2 % kaolinite. The insoluble clay fraction from the coral biomicrite shows a similar clay mineral composition. The origin of such pure smectite in the Jurassic has been discussed by Hallam & Sellwood (1968) and it is believed that these seams resulted from the alteration of contemporary volcanic material. Thus, besides their ecological significance, these sediments provide evidence for Upper Jurassic volcanism. Kent (1975) and Hallam & Sellwood (1976) reviewed evidence for volcanicity in the North Sea associated with rifting but did not specifically identify a late Oxfordian episode.

There are several records of corals and coral reefs under ecological stress. Events of mechanical destruction during tropical storms and effects of clay sedimentation on coral growth were reviewed by Stoddart (1969) and lava flows frequently interrupt growth of hermatypic corals in Hawaii (Grigg & Maragos, 1974).

There is, however, no modern record of actual volcanic ash smothering. Scoffin (1971) recorded the occurrence of two bentonite bands and thin shale seams in the Wenlock reefs of Shropshire. These generally correlate with indentations in the margins of the reefs suggesting that the lateral profiles were governed by the rate of clay sedimentation. Hubbard & Pocock (1972) recorded abrupt termination of cerioid coral forms from the Carboniferous of NW Ireland beneath an overlying shale parting and Dr G. Warner saw (pers. comm.) mud blanketing in a bay on the Gulf of Paria, Trinidad, where he noted partial damage of *Scolemia* due to silting.

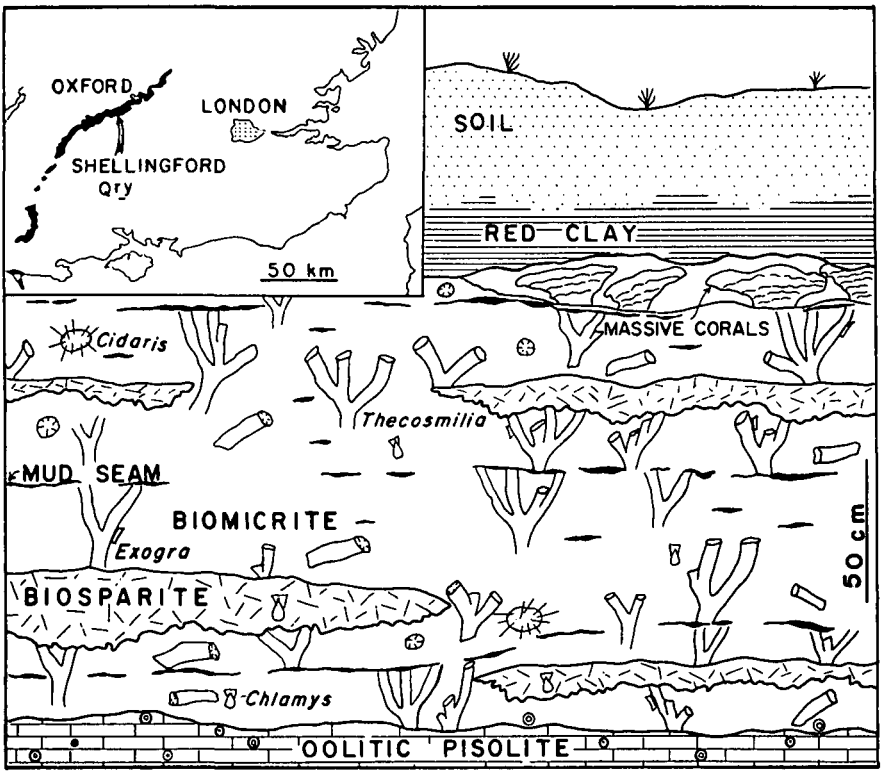

Figure 1. Diagrammatic representation of the coralliferous unit at Shellingford Cross Roads Quarry. Inset, outcrop of the Corallian (in black).

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