CRETACICRUSTA GEN. NOV., A POSSIBLE ALGA FROM THE ENGLISH CRETACEOUS

by GRAHAM F. ELLIOTT

ABSTRACT. An encrusting organism which shows zonal cell-differentiation and patterns of cells reminiscent of both Melobesieae and Solenoporaceae (Algae), and cell-sizes more in keeping with certain invertebrate organisms, is described as *Cretacicrusta dubiosa* gen. et sp. nov., and its nature discussed.

THE organism described below comes from the well-known Lower Cretaceous Sponge-Gravel of Faringdon, Berkshire, southern England. This is a current-bedded accumulation of calcareous marine organisms—mostly sponges, brachiopods, and bryozoa with subordinate echinoids and mollusca—in a matrix of iron-stained quartz-sand and pebbles. It is of Upper Aptian age (*nutfieldensis* zone): a summary account is given by Casey (1961), and the fossil now described came from the Lower or Yellow Gravels of the Little Coxwell Pit, Faringdon.

The specimen is a calcareous encrustation on sponge material collected by the late H. D. Thomas. It was recognized by him as possibly algal.

PROBLEMATICA (?ALGAE ?RHODOPHYTA)
CRETACICRUSTA gen. nov.

Diagnosis. Encrusting calcareous organism showing cell-differentiation into basal and subsequent layers reminiscent of the Melobesieae (Algae), with some cell-structures like those of the Solenoporaceae (Algae), and with cell-sizes larger than normal for these algae.

Type-species. C. dubiosa sp. nov.; Lower Cretaceous (Aptian) of England.

Cretacicrusta dubiosa sp. nov.

Plates 100–101

Diagnosis. Characters those of the genus, of which it is the only known species.

Description. This organism encrusts a fragment of one of the calcisponges which, whole or broken, make up much of the bulk of the yellow sponge-gravel. The encrustation is 25 mm in diameter and about 3 mm thick, with outer surface smooth to the naked eye and finely perforate under magnification.

In thin-section calcisponge tissue forms the core of the section. Resting on the outer surface of this core is a conspicuous basal single layer of cells. In vertical section these are irregularly four-sided with diameters of up to 0·180 mm. Although somewhat irregular in shape and variable in size they form a markedly differentiated layer, with conspicuous dark cell-walls of about 0·010 mm thickness and with clear calcite cell-fillings. This layer underlies almost the whole of the subsequent encrustation, though at one spot it appears to have been destroyed by replacement.

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Where the plane of section cuts through this layer at varying angles, due to its close application to an irregular or twisted surface, the cells are seen to be elongate, up to a length of 0·630 mm in one case, though only half this dimension is shown by several other examples. From the limited evidence available it is not clear what is a normal cell-length.

The succeeding layer of cells is, for some reason, mostly destroyed and replaced by calcite, and so appears as a conspicuous clear seam. But at one spot it is seen to consist of squarish cells, each matching those of the basal layer in diameter and a little higher (up to 0·225 mm) in vertical section.

This layer is succeeded by the main portion of the organism. This consists of adjacent, parallel, slightly irregular, and densely septate tubes, set vertically to the exterior, and each apparently following on a cell of the subjacent layer. Preservation is not as good as for the basal layer (the sponge-gravel matrix is of quartz grains with much irregular calcite cementation and iron-staining). Intercalation and bifurcation are not clearly distinguishable, the tubes increasing only slightly in diameter outwards, perhaps most so for accommodation of growth from where the basal layer is curved. On a better-preserved portion near the periphery the inner tube diameters are 0·090–0·108 mm with wall-thickness very irregular but with a mean of about 0·045 mm. Mid-wall to mid-wall the diameter is about 0·180 mm. The crowded septa are gently curved in section (concave when viewed with the outer surface of the encrustation uppermost), 0·010 mm thick, and occur at intervals of 0·027–0·036 mm.

Holotype. The specimen figured in Pls. 100–101, from the Yellow Sponge-Gravel (Lower Cretaceous, Upper Aptian, *nutfieldensis* zone); Little Coxwell Pit, Faringdon, Berkshire. Brit. Mus. (Nat. Hist.) Dept. Palaeont., reg. no. V27998.

Discussion of affinities. The clear differentiation of this organism into two layers, the basal and adjacent cell-layers together on the one hand, and the main septate-tubular portion on the other, is reminiscent of the hypothallus and perithallus in many members of the Melobesieae or calcareous encrusting red algae. Here the hypothallus of squarish-sectioned, elongate cells, is the initial spreading layer, adapting itself to irregularities in

EXPLANATION OF PLATE 100

Figs. 1–4. *Cretacicrusta dubiosa* gen. et sp. nov., holotype; thin-section. From the Yellow Sponge-Gravel (Lower Cretaceous, Aptian, *nutfieldensis* zone); Little Coxwell Pit, Faringdon, Berkshire, England. Brit. Mus. (Nat. Hist.), Dept. Palaeont., reg. no. V27998. 1. Calcisponge tissue on right, succeeded by basal structure of *Cretacicrusta* (two cell-layers), then by main tubular portion of the organism to the left; ×35. 2. Enlarged view of part of fig. 1, showing clear dark-walled cells of the basal layer in transverse section, and the second cell-layer (to the left) which is re-crystallized; ×110. 3. The same view and structures as in fig. 1, from a different part of the thin-section, to show the elongate-irregular form of the basal cells on a twisted sponge-surface; ×35. 4. Enlarged view of part of fig. 3; ×110.

EXPLANATION OF PLATE 101

Figs. 1–2. *Cretacicrusta dubiosa* gen. et sp. nov., holotype; details as Pl. 100. 1. Calcisponge tissue bottom left, then dark-walled basal cells of *Cretacicrusta*, succeeded by a portion of the second cell-layer showing individual cell-outlines corresponding to the individual basal cells. At the top right the main septate-tubular part of the organism commences, the tubes corresponding to the underlying cells; ×110. 2. Details of well-preserved peripheral portion of tubes, showing close-set concave septa; ×140.

the substratum. The succeeding thicker perithallus, of vegetative and reproductive cells, is of different cell-structure. In *Cretacicrusta*, however, the main layer (?perithallus equivalent) is in its septate-tubular structure much more like the Solenoporaceae, whose hypothallus is rudimentary and not well differentiated. That the two layers are parts of the same organism and not two separate successive encrusting growths seems probable from the close correspondence and apparent continuity of the tubes with the subjacent cells. No reproductive structures have been recognized, which is a typical negative character for the Solenoporaceae.

A basal layer which is perhaps comparable is figured by Öpik and Thomson (1933) for *Solenopora* cf. *nigra* Brown, but the cells are much smaller.

In dimensions, however, the cells and tubes of *Cretacicrusta* are much larger than those of most algae. They are about double those of a solenoporoid, and melobesioids are smaller still.

Comparison with invertebrate encrusting organisms yields no close parallel. In a British example of a Mesozoic Chaetetid, *Blastochaetetes bathonicus* J.-C. Fischer, recently recognized by me from the Great Oolite (M. Jurassic) of Gloucestershire, the tubes are twice the diameter of those in *Cretacicrusta*, and the septa are mostly straight in section and very irregularly set. *Cretacicrusta* does not show typical hydrozoan structure (the stromatoporoid *Actinostromaria faringdonensis* Thomas occurs very rarely at Little Coxwell), nor typical bryozoan structure.

In view of these comparisons, *Cretacicrusta* can only be considered a problematic organism, possibly algal. It is anomalous in combining melobesioid and solenoporoid characters with unusually large cells. I have elsewhere (Elliott 1965) reviewed the relationship and possible evolutionary connection between the Solenoporaceae and Melobesieae, the latter having replaced the former during geological time. In the Solenoporaceae occasional rare developments, possibly to be interpreted as reproductive structures like those of the Melobesieae, were unsuccessful in evolution. If *Cretacicrusta* is a similar solenoporoid achievement of a true hypothallus it seems to have been equally unsuccessful.

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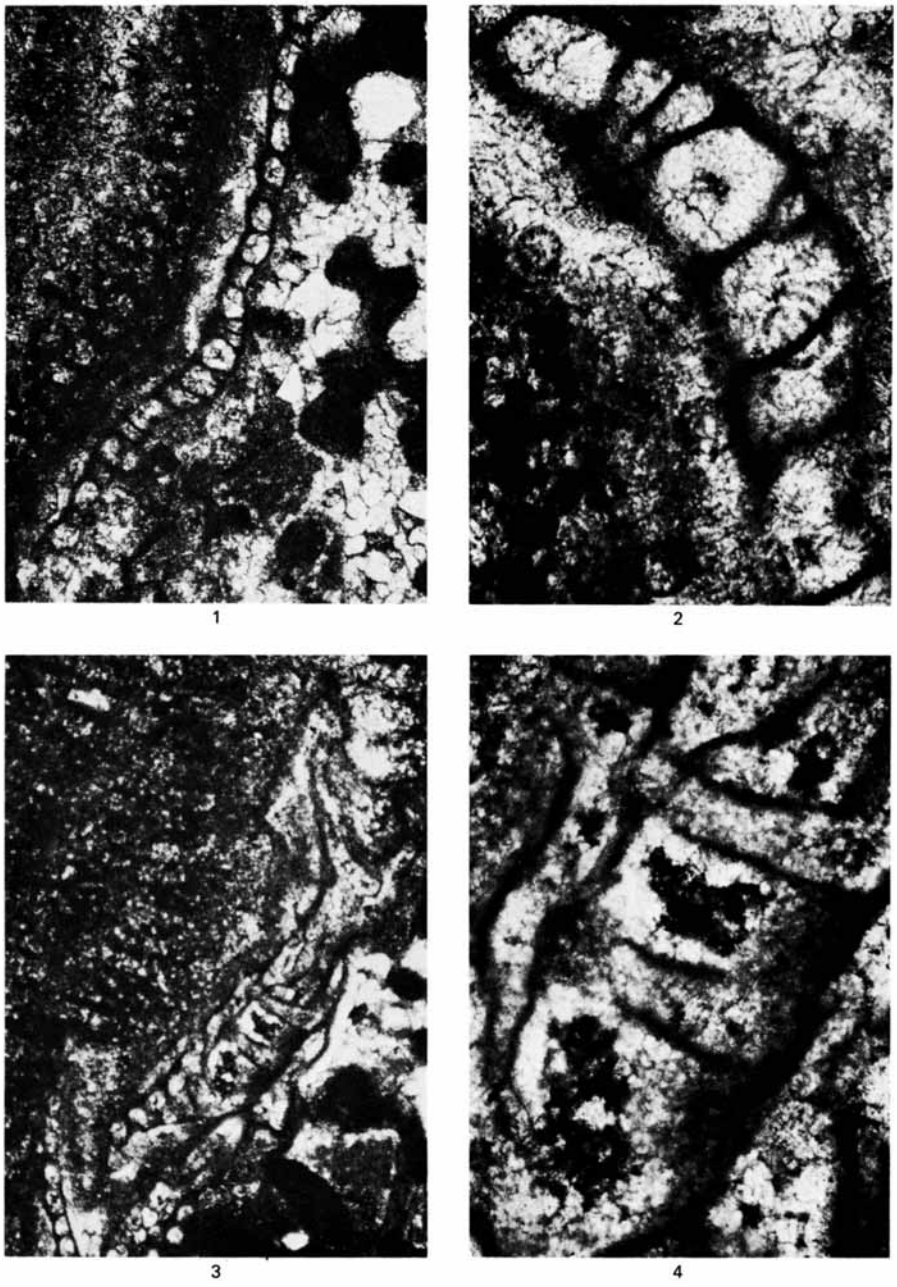

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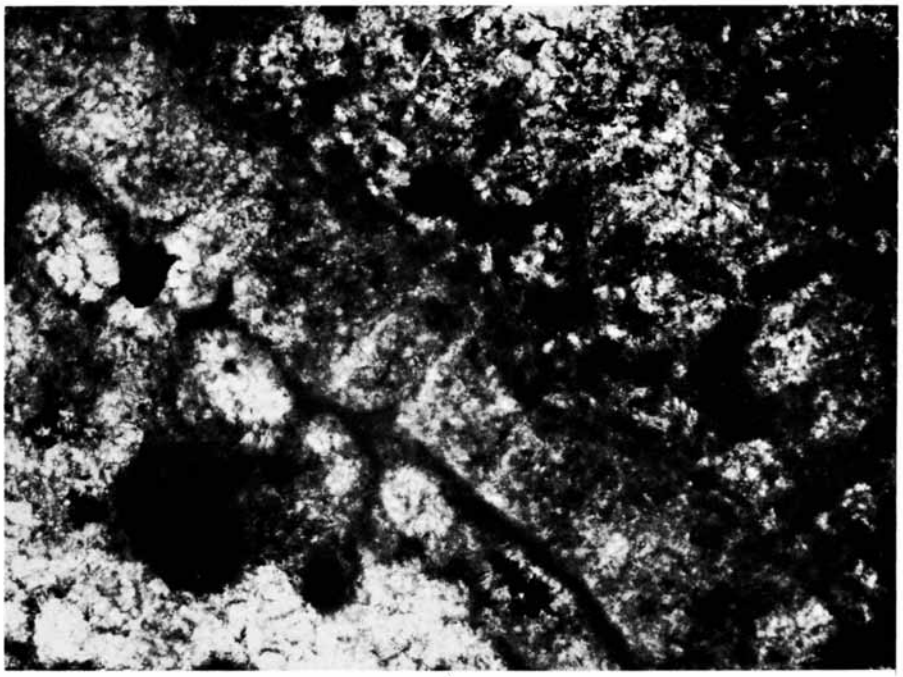
ELLIOTT, *Cretacicrusta*



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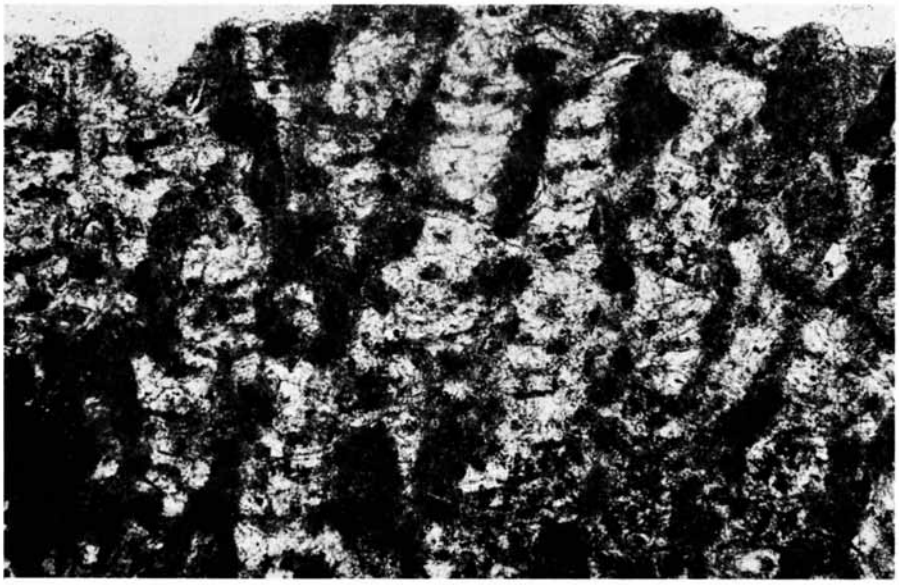

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ELLIOTT, *Cretacicrusta*