DISTRIBUTION AND AFFINITIES OF THE JURASSIC DASYCLADALEAN ALGA *SARFATIELLA*

by GRAHAM F. ELLIOTT

ABSTRACT. Information on the nature, taxonomy, and stratigraphical and geographical distributions of the dasycladalean algal structure *Sarfatiella* is summarized. It is suggested that *Sarfatiella* is the calcified reproductive structure of an otherwise non-calcified dasycladalean. Its middle Jurassic palaeogeographical distribution is latitudinally wide and believed to have been subtropical as well as tropical.

THE fossil dasycladalean algal structure known as *Sarfatiella* was first figured and discussed, but not named, from the Bajocian of the Corbières, southern France, by Lemoine and Sarfati (1963). Subsequently, it was formally described and figured as *Sarfatiella dubari* by Conrad and Peybernès (1974) from the Aalenian–Bajocian of the Pyrenees. Since then *Sarfatiella* has been recognized as fragments in thin section from many localities (e.g. Radoičić 1976, Elliott 1977, Bassoulet *et al.* 1978). It is frequently assigned with reservation to the structurally similar alga *Cylindroporella*. This paper summarizes certain problems concerning *Sarfatiella*, and discusses its wide and interesting geographical distribution. The specimens studied by me are from England and from Madagascar, and are now in the collections of the British Museum (Natural History).

SARFATIELLA: ANATOMY AND NOMENCLATURE

Sarfatiella shows a central canal or presumed stem-cell cavity, surrounded by successive horizontal whorls, each comprising about eight globular or near-globular 'ampoules' or presumed reproductive cavities, each of these communicating with the stem-cell cavity by a short narrow canal. In the specimens I have examined, the ampoules are crowded and slightly displaced vertically, so making it difficult to count the number per verticil in thin-section. There are no sterile branches preserved, and the ampoules and canals are different in proportions, from sterile branches with associated reproductive structures as seen in many other dasycladalean genera. Calcification in the living plant appears to have originated around individual ampoules and then to have fused to give the cylindrical tubular structure with ampoule cavities within it. Specimens usually show the outer ampoule calcification (peripheral to the cylinder) broken or worn away, presumably a consequence of release of the contents. In *Cylindroporella*, confused with *Sarfatiella* by several workers including myself, and also in *Heteroporella*, the calcified tube contains records of infertile branch systems as well as of fertile ampoules (Bassoulet *et al.* 1978).

The tubes or cylinders of *Sarfatiella* often form the nuclei of superficial ooids or of small oncoids, or they have been worn into clasts. Peybernès (1976) noted their occurrence in this kind of microfacies in the Pyrenees, and this is true also for England (Elliott 1975), and in the Madagascan material available to me.

Clearly these structures are not a record of the whole living plant. It is suggested here that this was a 'conventional' non-calcified dasycladalean, with nucleate holdfast and central stem-cell with successive verticils of sterile side branches, and that before death or seasonal dying down, the upper terminal whorls grew as a calcified reproductive area with the contents being released later. Probably each calcified structure was the terminal portion of a single plant, though it is just possible that there were several to each plant, if it branched like the living *Cymopolia*.

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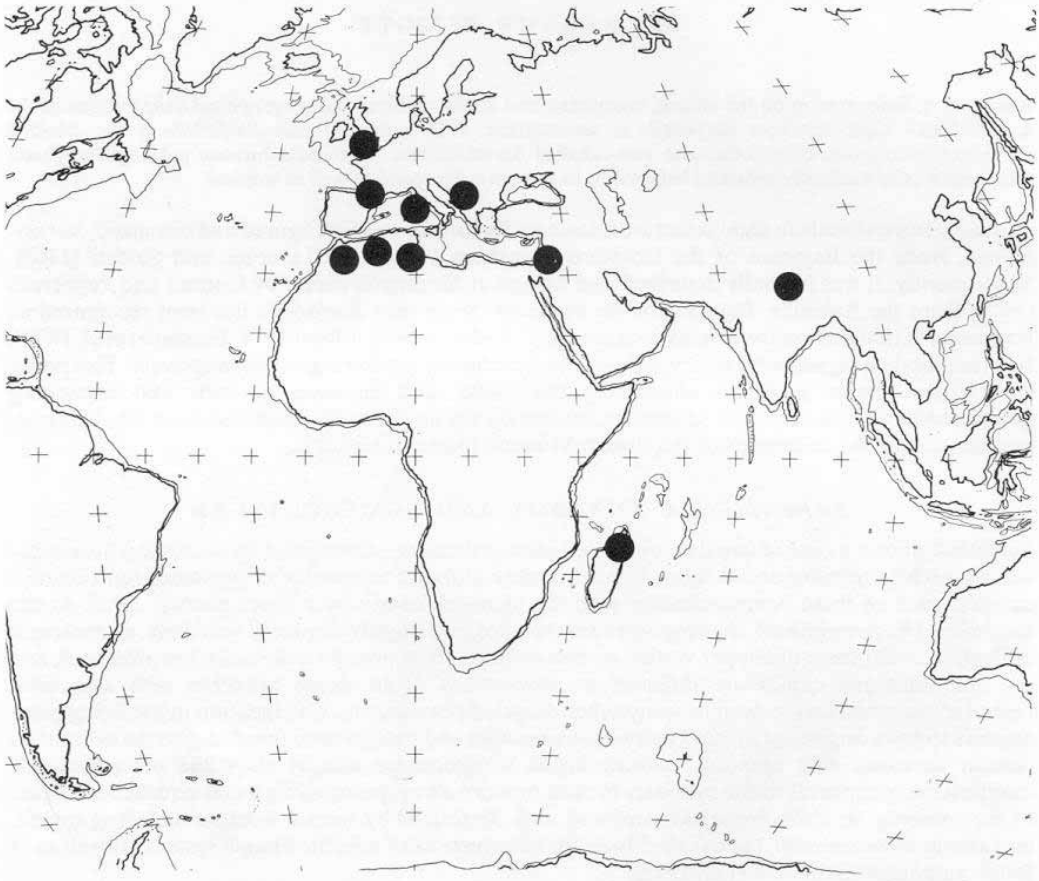
Holosporella from the Thailand Trias (Pia 1930) has been compared with *Sarfatiella* by various authors from Lemoine and Sarfati onwards. Essentially, in the former the very similar calcified ampoules do not communicate with the central cavity, and Pia interpreted it as a calcified 'endospore' structure within the stem-cell cavity of an otherwise non-calcified dasycladalean. Neither his diagrammatic figure nor his other figures show any canals between ampoules and central cavity, and he does not mention them in the text. There is some uncertainty about the Triassic age of the Thailand specimens (Pia 1930, Pia *in* Narayana Rao and Sripada Rao 1937, and Bassoulet *et al.* 1978, p. 256). *Holosporella* is also known from the Indian Palaeocene (Narayana Rao and Sripada Rao 1937; Pia,



TEXT-FIG. 1. Distribution of middle Jurassic *Sarfatiella* at the present day.

EXPLANATION OF PLATE 70

Figs. 1–5. *Sarfatiella dubari*, Conrad and Peybernès. Thin sections × 100: all from Bathonian, middle Jurassic. 1, longitudinal section; Antankarana, North Madagascar; British Museum (Natural History), Dept. Palaeontology; Reg. no. V.3213a. 2, oblique-longitudinal section; Daglingworth, Gloucester, England; Reg. no. V.57659. 3, oblique-longitudinal section of a *Sarfatiella*-clast; Grandage, Quenington, Gloucester, England; Reg. no. V.60942. 4, tranverse section; Antankarana, North Madagascar; Reg. no. V.3213b. 5, transverse section of a *Sarfatiella*-pseudooid; Daglingworth, Gloucester, England; Reg. no. V.57661.

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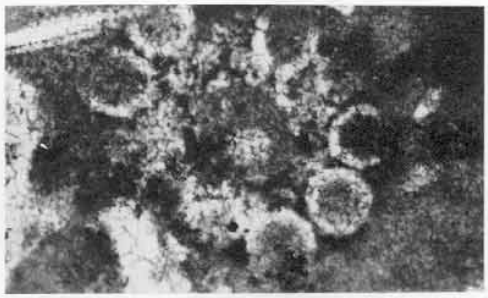

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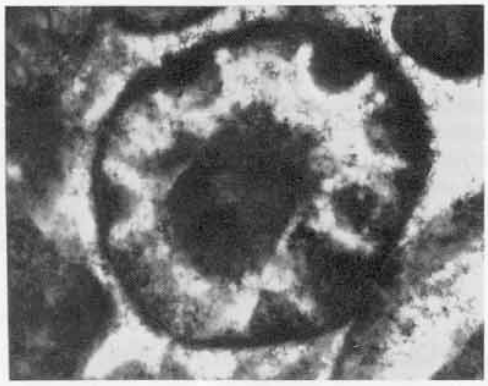

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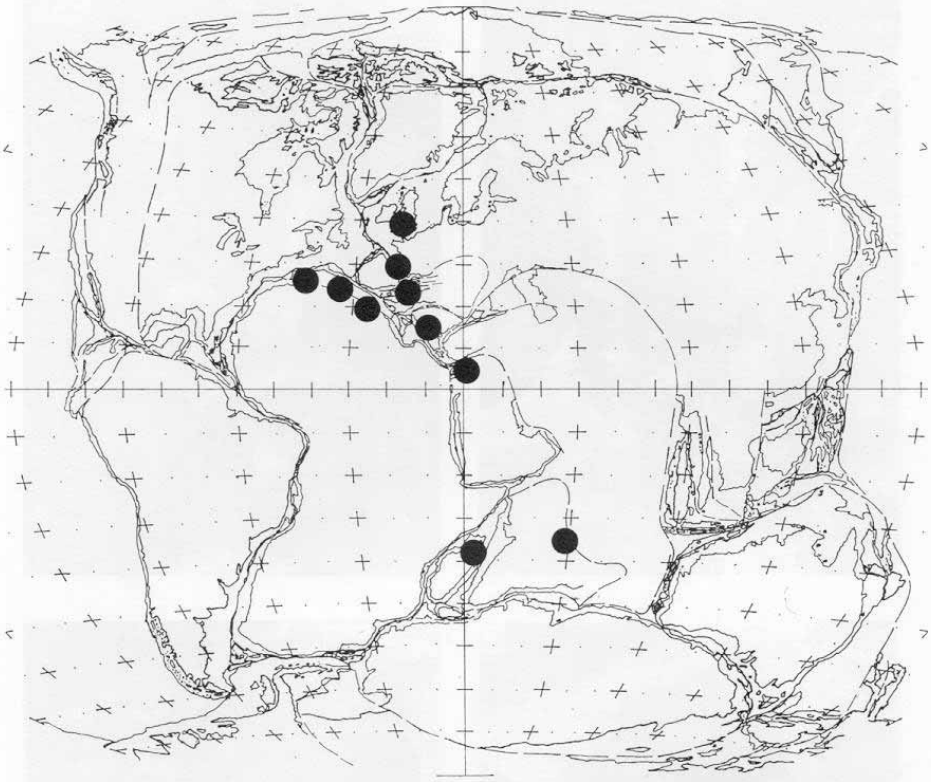
ELLIOTT, *Sarfatiella*



TEXT-FIG. 2. Distribution of *Sarfatiella*, plotted on a Pangaean continental grouping for the early Mesozoic (Owen 1981).

Narayana Rao and Sripada Rao 1937; Sambe Gowda 1953). Should the type *Holosporella* be found to show communications between ampoules and central cavity it would invalidate Pia's hypothesis and it could affect the validity of the name *Sarfatiella*. The problem is complicated by a qualified record of *Sarfatiella*? from the French Palaeocene (Segonzac 1979). The problems in classifying such dissociated calcified parts of extinct algae are worse still with *Acicularia s.l.*, which has even fewer diagnostic characters (ref. Elliott 1981). Bassoulet *et al.* (1979) wisely do not attempt to place *Sarfatiella* in a detailed dasycladalean classification. I follow Bassoulet *et al.* (1978) in using *Sarfatiella* for the middle Jurassic specimens in which the communication pores are often clearly to be seen if sufficient random sections are available. This can be seen both in the French type descriptions, and in English and Madagascan material studied by me.

DISTRIBUTION OF *SARFATIELLA* IN THE MIDDLE JURASSIC

Sarfatiella has been recorded from the middle Jurassic over a wide area. Three accounts summarize this information, containing both original records by the authors themselves and recognition of the genus from previous accounts. These summaries are those of Radoičić (1976), Elliott (1977), and

Bassoulet *et al.* (1978). Where horizons within the middle Jurassic are given, records are of Aalenian–Bajocian, Bajocian, Bathonian, and one of Callovian age. The combined middle Jurassic geographical distribution from these accounts is shown in text-figs. 1 and 2.

It can be seen that not merely does *Sarfatiella* occur at several localities in the tropical western Tethys, where it accompanies the larger and much more conspicuous middle Jurassic *Selliporella*, but the former also extends outside this, north and south of the palaeoequator, to the subtropical areas poor in Dasycladales (see Elliott 1977, 1982). It occurs in the north in the Cotswold district of England, and in the south in Madagascar and Nepal (the latter then south of the Jurassic equator in the present-day Indian Ocean area, on the Indo-Sub-Tibetan Plate).

Sarfatiella in the Jurassic is thus a useful and widespread algal indicator of the Dogger or Middle part of the system. It is to be hoped that the uncertainties over *Holosporella* can be resolved in the future.

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G. F. ELLIOTT
Dept. of Palaeontology
British Museum (Natural History)
Cromwell Road, London SW7 5BD

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