Record of a stromatolite-algal mat horizon in the Syringothyris Limestone (Lower Carboniferous), Liddar Valley, Kashmir

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Abstract

A prominent ca. 1.50 m thick unit of algal mat facies is recorded from the topmost part of the Syringothyris Limestone (Lower Carboniferous) showing development of well-defined columnar stromatolites. The columnar stromatolites are generally 4-8 cm long (maximum about 15 cm long), possessing a rugged outer margin showing sheathing; and often exhibit flattening and deformation of laminae near the top. The horizontal algal mat lamination exhibits thick laminae, some vuggy features, and bird's eye structure. Intertidal zone, with parts extending into supratidal, is inferred as the palaeoenvironment in this unit.

Introduction

Stromatolite-bearing algal mat facies, which make extensive and thick succession in the Proterozoic, are not so common in Phanerozoic. Recently, Monty (1981) tried to bring together the information on Phanerozoic stromatolites. From Indian subcontinent there is no systematic account of Phanerozoic stromatolites. Hashmi (1971) reports that the rocks of Permian age in Aru Valley show occasional branching stromatolites, which contain phosphorite along interlaminar partings. However, this report is not documented by any photograph, sketch or other details. The report of Kumar (1981) about stromatolites from Krol sediments to be Phanerozoic, cannot be accepted because of the controversial age of the Krol.

The present paper, describes 1.50 m thick horizon of algal mat facies, showing well-formed columnar stromatolites from the uppermost part of Syringothyris Limestone (Lower Carboniferous).

Algal mat horizon

The algal mat horizon under discussion is exposed in the Aishmuqam ridge, Ayun spur (33°52'20; 75°17'40") in the topmost part of Syringothyris Limestone (Member C of Kumar *et al* 1980). The Member C also contains bands showing corals, few brachiopods and gastropods and is made up of calcarenite, quartz arenite, shale and siltstone, and is assigned a Lower Carboniferous age (Kumar *et al* 1980).

The algal mat horizon is about 1.50 m thick, essentially made up of fine-grained carbonate showing thick undulatory layering, which is internally made up of very thin, crenulated laminae of algal origin. Within this horizon, columnar stromatolites are distributed and are more abundant in the middle part. A schematic litholog showing distribution of stromatolites is given in Fig. 1. In the lower part, a few, sparse, narrow (about 1-1.50 cm wide) but 5-8 cm long columns are seen within a more smoothly layered algal mat (Plate 1 – 2,5). This is followed by a 30 cm thick unit where algal mat laminations are highly crenulated and crumpled. There are bands with abundant stromatolites, which are mostly 3-4 cm broad and 5-8 cm long (Plate I – 1,3). These columnar stromatolites possess a broad, flat irregular

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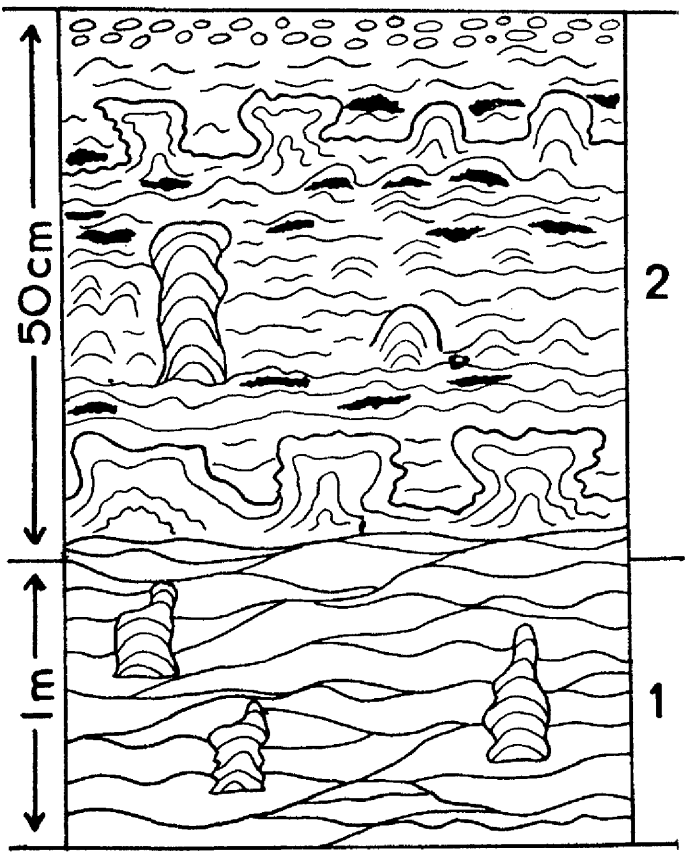
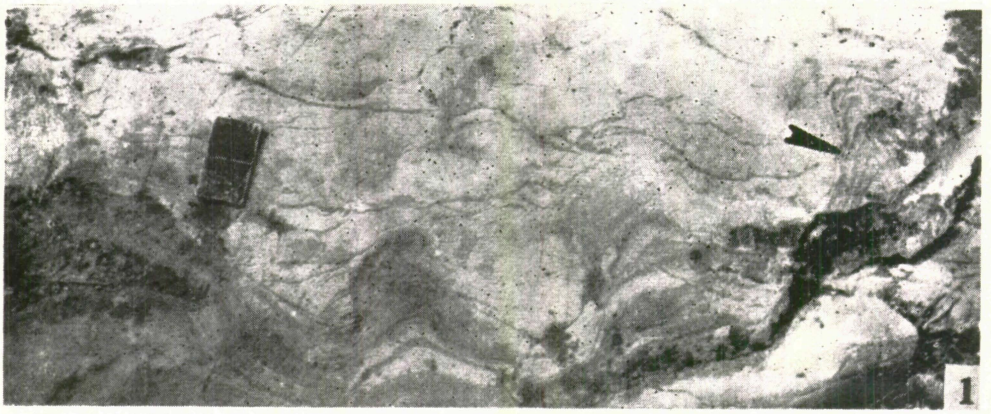


Figure 1. Schematic stratification sequence of the algal mat horizon in the Syringothyris Limestone in Aishmuqam ridge. 1 - Lower part, showing thick undulatory layers with scattered columnar stromatolites. 2 - Upper part, showing several stromatolite-bearing bands. The stromatolites mostly show highly crenulated lamination and possess a flattened top. At the top of the sequence a conglomerate layer is present.

EXPLANATION OF PLATE I

1. A stromatolitic horizon showing several columnar stromatolites growing from the same horizon, but reaching variable heights. In the lower part of some of the columns (marked with arrow) laminae are conical, but become flat-topped in the upper part. Length of scale=2 cm. Syringothyris Limestone, Aishmuqam ridge, Liddar Valley, Kashmir.
2. A single columnar stromatolite from the lower part (1 of Fig. 1) of the unit. The column shows a variable width, no branching, variable convexity of the laminae. A prominent sheathing (wall) is present. Near the top column shows somewhat irregular growth of the laminae. Length of scale=2 cm.
3. Stromatolitic horizon from the upper part of the algal mat unit. The growth of stromatolites is irregular, and exhibits highly crenulated laminae. There are also vugs and bird's eye structure present. Length of scale=2 cm.
4. A closer view of a columnar stromatolite showing prominent sheathing, and highly crenulated laminae in the topmost part of the column. 1 div. of scale=1 mm.
5. Algal mat band showing a few highly irregular stromatolitic growth. Length of scale=2 cm.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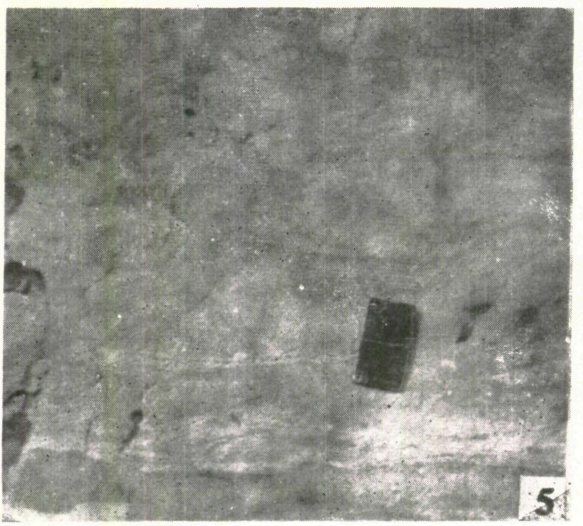
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top, where laminae become flat and distorted (Plate I – 3,4). A few slender columns are also seen. In this part irregular vugs and bird's eye structures are common (Plate I – 3).

Above this follows a 20 cm thick band of highly crumpled algal lamination with rare stromatolite growths. The unit is capped by a 3 cm thick conglomerate horizon. A more detailed study of these stromatolites, i.e., three dimensional reconstruction, and characters of the laminae is in progress.

Palaeoenvironment

The Syringothyris Limestone is a thick succession of carbonate, shale, shell banks, and sandstones, and shows both faunistically and sedimentologically sufficient characteristics which suggest its deposition in a shallow sea.

The carbonate succession, just below the algal mat horizon shows ripple bedding, wave-built structures suggesting some kind of sand bar or shoal deposit. Probably, behind such sand bars locally, conditions became favourable for the development of algal mat facies. The succession as shown in Fig. 1 represents a progradational cycle, where the sequence starts from lower part of intertidal zone and extends into supratidal zone. The topmost conglomerate layer, probably, represents a phase of increased energy which led to the destruction of algal mats. Vuggy nature of algal mat facies in the middle part of the horizon, along with highly contorted laminations point to its deposition in upper part of intertidal to supratidal zone.

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