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GENESIS OF STROMATOLITIC TEXTURES IN THE STROMATOPOROID BINDSTONE OF THE LOWER DEVONIAN GARRA FORMATION, NEW SOUTH WALES, AUSTRALIA

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Laminar characteristics of stromatolites are generated in relation to cyclic environmental changes. Stromatolitic textures that are formed by both microbes and large skeletal organisms are developed to a remarkable degree in a biohermal limestone (*sensu* Strusz, 1966) of the Lower Devonian Garra Formation of New South Wales, Australia.

In the studied section, stromatolitic textures are found in association with stromatoporoid bindstone and consist roughly of regular alternations of both 1) laminar stromatoporoids ca. 5mm thick, whose laminae are at intervals of two to three hundreds of micrometers and 2) microbialites ca. 1-2mm thick. Tabulate corals (*Favosites*) occasionally replace laminar stromatoporoids. The skeletal organisms occupy 40-80% in area in thin sections, whereas microbialites occupy 10-15%. The remaining matrix includes sand sized clasts of tabulate corals, crinoids and gastropods, and those sediments are directly covered by stromatoporoids. Microbialites are composed of silt sized peloids, dense micrites and *Girvanella* with external diameters ranging from 10 to 15μm. Surfaces of stromatoporoids are ordinarily heavily micritized, where coccoid microbes, 30-80 μm in diameter preferentially bore into stromatoporoids in the opposite sense to the growth direction of the stromatoporoid, suggesting that the boring activities have occurred after the death of stromatoporoids, Those microbialites are present where stromatoporoids and tabulate corals are conspicuously notched laterally and/or occupy the topmost surfaces of the frameworks. Minute columnar stromatolites, ca. 1mm in height are in rare cases formed everywhere within the intraframework, in cryptic spaces whose roofs also are lined with pendant microbialites composed of peloids and *Girvanella*.

The evidence noted above suggests that the stromatolitic textures were formed as follows: 1) stromatoporoids grew and stabilized bioclastic sediments; 2) stromatoporoids were partly damaged by episodic deposition and subject to bioerosion. Microbialites were formed by microbial activity, such as by *Girvanella*; 3) surviving stromatoporoids spread laterally and vertically to cover underlying microbialites and matrix; and 4) intervening cryptic spaces produced by repeated laminar growth of stromatoporoids provided a unique environment suitable for the development of columnar stromatolites on the cavity floors and pendant microbialites on the roofs.

Laminar stromatoporoids are generally considered to grow under conditions of low sedimentation (e.g., Kershaw, 1981). Background sedimentation in this section was normally low but became intensive episodically with influx of coarse particles to damage skeletal organisms, including stromatoporoids, and allow microbes to flourish, especially on the partially killed surfaces of the organism. The stromatolitic textures noted herein were thus inferred to have been brought about by repeated partial mortality of stromatoporoids and tabulate corals due to intermittent severe sedimentation, subsequent intensive microbe activities, regeneration of skeletal organisms, and microbialite infillings of cryptic spaces.

References

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