A NOTE ON BIOTURBATION IN THE LAMETA BEDS, JABALPUR AREA, M. P.

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ABSTRACT

The bioturbation structures of both *Fossitextura-deformativa* and *Fossitextura-fugurativa* types are recorded for the first time from the Mottled Nodular Beds of Lameta Group. The lebensspuren (Burrow structures) fall under the dwelling structures. On this basis the environment of deposition of Mottled Nodular Bed is discussed.

INTRODUCTION

The bioturbation has been defined as the structures produced by the activity of living animals within the sediment or on the sediment surface (REINECK & SINGH, 1973). The generation of bioturbation structures causes destruction or deformation of primary sedimentary structures which were produced by the inorganic processes during sedimentation (RICHTER, 1936 *cited in* REINECK & SINGH, 1973). The bioturbation structures give a more reliable record of benthonic communities in comparison to body fossils like shells and bones etc. because the bioturbation structures are formed *in situ*, i.e. they are autochthonous while the body fossils are transported and then deposited.

In the present note, well preserved bioturbation structures are recorded for the first time from the Mottled Nodular Beds of the Lameta Group of Jabalpur area, M. P., and it appears that the Mottled Nodular Bed is completely bioturbated. The detailed work on the bioturbation structures of the Lameta Bed is in progress.

GEOLOGY

The Jabalpur area of Madhya Pradesh constitutes the type area of well preserved sedimentary rocks of Middle Cretaceous age, designated as Lameta Group by MATLEY (1921). These rocks are well known for their dinosaur remains. The bulk lithology of Lameta beds varies from arenaceous limestones to sandstones and the total thickness is about 35 meters. These conformably overlie the fresh water Jabalpur Group and show a sharp contact with the overlying Deccan Traps. The stratigraphic succession of the Jabalpur area is given in Table 1.

Table 1 (After Matley, 1921)

Deccan Traps	Volcanic flows
Lameta Group	Upper Sands Upper Limestone (local zone) Mottled Nodular Beds Main or Lower Limestone Green Sand
Jabalpur Group	White Clays Sandstones
Non Conformity	
Ancient Crystalline Rocks	Granites and schists

Mottled Nodular Beds

The Mottled Nodular Bed is represented by a set of red, green and mottled sandy and clay beds, usually 15 to 20 meters thick, characterised by many sandy calcareous concretions. On weathering, the rocks give an appearance of a coarse grained rubble. No bedding character is visible in any of the sections observed. Even in the freshly exposed sections in the road cutting on Bara Simla, only a massive non-laminated calcareous sandstone is seen with green and red colour mottling.

However, on the weathered surfaces, these beds show well-preserved, tube like structures of varying dimensions (Pl. 1, Figs. 1, 2). These are well preserved burrow structures (*Thalassinoides*). In cross sections these appear as circular to elliptical, the smallest is about 3 mm in diameter and a few cm in length and the largest is about 5 cm in diameter and is more than 15 cm in length. The smaller burrows are walled. Mostly the smaller ones are vertical with respect to horizontal bedding plane, but the larger ones show irregular pattern (Pl. 1, Fig. 2). They also show branching. These burrow structures (lebensspuren) fall under the dwelling structures of Seilacher (1953, *in* Reineck & Singh, 1973). The dwelling structures are made by the organisms for the purpose of living in them.

In the present area, both the types of bioturbation structures of Shafer (1972) are recognised, (i) *Fossitextura deformativa*—these are bioturbation structures without any definite form. They appear as formless mottled structures or irregular flecks of different grain size, colour etc. (Pl. 1, Fig. 3), and (ii) *Fossitextura fugurativa*—these are bioturbation structures possessing definite recognizable forms such as burrows (Pl. 7, Figs. 1, 2). The former is well seen on the Bara Simla road-cutting and Chui hill and the latter is best seen on the footpath from Patbaba Ridge to Bara Simla and at Lameta Ghat.

In thin section, these burrows are made up of calcite, chert and clay with irregularly distributed subangular to subrounded quartz grains of varying sizes. Some oolites of calcite with nucleus of quartz are also seen. A few spherulites of silica are recorded which may be pseudomorph after calcite, and may have a biogenic origin.

Environment of Deposition

There is no general agreement on the environment of deposition of Lameta Beds. Since they yielded well-preserved fossils of dinosaurs of Cretaceous age, Matley (1921) considered these beds to be of fresh water origin. Sahni and Mehrotra (1974) suggested that the Lameta represents a fluvial deposits formed by rivers flowing in general southerly direction. Thin gastropod band in Mottled Nodular Bed which yielded *Vivaparus normalis*, a fresh water gastropod and *Melania*, *Poludina* and *Physa prinsipii*, has also been cited by them in favour of fresh water origin.

However, Chanda (1963) advocated that the Lametas are of marine origin and the transgressive character of these beds strikingly match with those of typical orthoquartzite-carbonate association believed to be the product of sedimentation marginal to a very low lying land surface. He further states that the sandstones reflect a high energy dissipation in tectonically stable condition.

The beginning of the deposition of the Lower Limestone marks a change from fluvial to marine supratidal environment of deposition. During the deposition of the Lower Limestone the clastic sediments were continuously being brought by the rivers and were deposited with nonclastic sediments (limestone). The beginning of the deposition of limestone marks the transgressive phase in Jabalpur area. Chanda (1967) has suggested a shallow water marine origin for the limestones of the Lameta Group.

The discovery of burrow structures *Thalassinoides* in the Mottled Nodular Bed is of great significance in the reconstruction of the environment of deposition, otherwise in absence of any well preserved sedimentary structures and complete obliteration of the bedding features, reconstruction of the environment of deposition is quite difficult.

The absence of bedding in the Mottled Nodular Bed is an important and interesting feature. SAHNI AND MEHROTRA (1974) interpreted the mottled and nodular nature due to the fluvial processes. But this feature is due to bioturbation by the animals living in that environment who built burrows for their living. These were responsible for the complete destruction of the bedding. This can be achieved in an environment of slow but continuous sedimentation with complete biogenic reworking by animals. If sufficient time is available only a limited varieties of animals can destroy the sedimentary features.

The abundance of diversified burrows produced by a crustacean dicapod—*Callianassa*, in the modern beach environment is noteworthy. In Mugu Lagoon, in California, WARME (1967) reported that the two species of *Callianassa* commonly dig 60-100 cm below the sediment surface. It has been noted that a typical bed of these can completely rework 75 cm of sediments in eight months. In Mugu Lagoon, these are most abundant in sandy parts. Thus, it may be suggested that the bioturbation in Mottled Nodular Bed may be the work of a curstacean-like animal or animals.

The presence of oolites in burrow structures suggest a high energy environment. The small burrows indicate a zone of relatively high water energy (O'SULLIVAN & MABEERY, 1976).

The dinosaur fossils in the Lameta Beds are rare and these have been recovered from a few localities. It appears unlikely that the fossil remains were deposited in areas much nearer to the places of decay of animals. These fossil remains may have been transported by the rivers and deposited in a marine environment. SAHNI AND MEHROTRA (1974) have pointed out the dominance of carnivorous dinosaurs in Jabalpur fauna, whereas in any locality the herbivores should always be in larger number than the carnivores. Thus, the Jabalpur fauna does not represent the contemporary population. The reason may be that the deposition of dinosaur remains took place in shallow marine environment brought by the rivers, and they represent only those genera whose remains could reach the shore line.

The gastropods found in the Mottled Nodular Bed also represent fauna which lived in the rivers and were brought along with the sediments in the sea and deposited.

The preliminary investigations by the authors revealed the presence of arenaceous foraminifers such as *Jaculella* sp., *Psammophaera* sp. and *Saccammina* sp. further supports that the Mottled Nodular Beds are of marine origin.

Thus the beginning of the deposition of the Mottled Nodular Bed marks a change from supratidal to beach-like environment with low supply of clastic material. It may be concluded that the entire thickness of the Mottled Nodular Bed represents coastal sand deposits.

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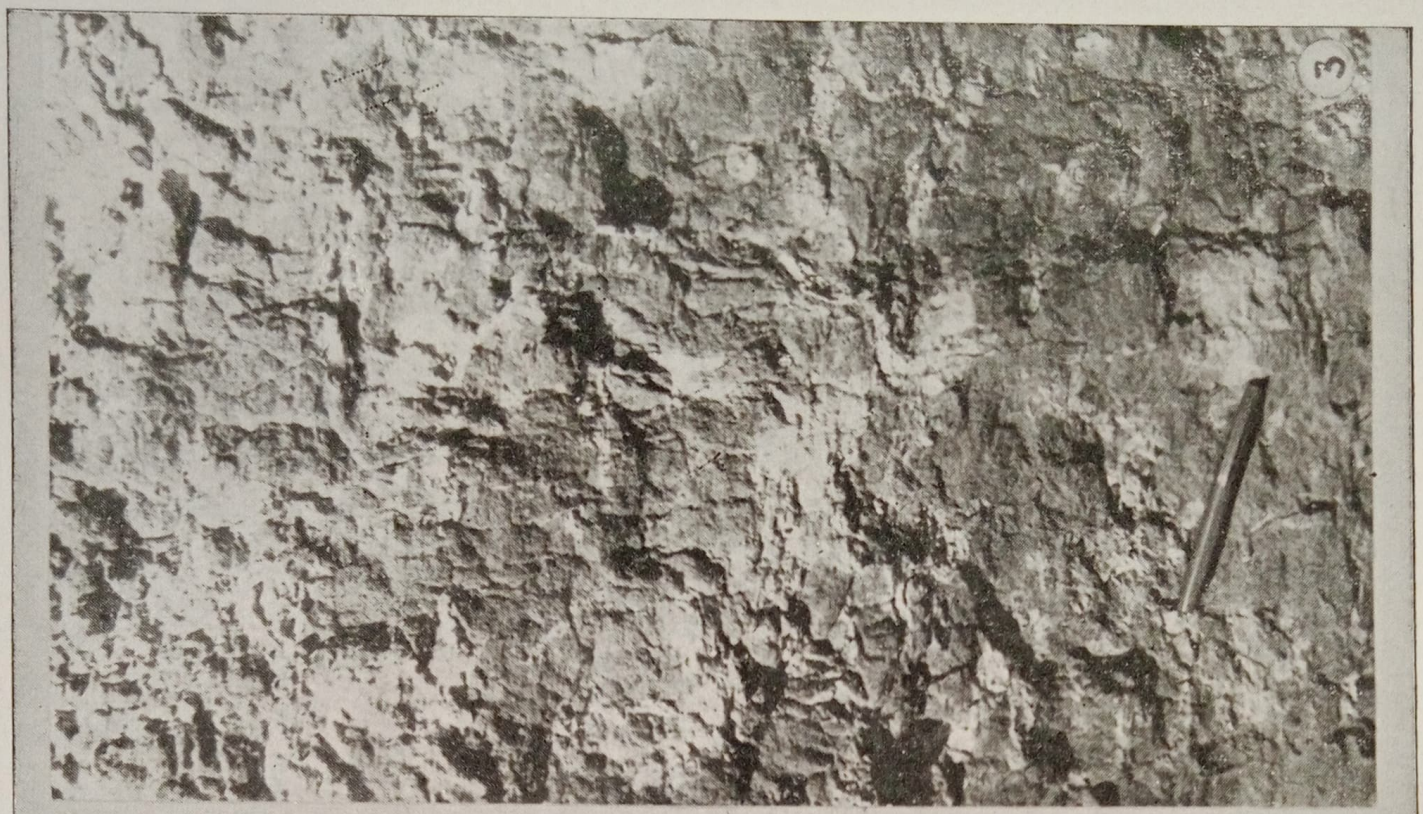
EXPLANATION OF PLATE 1

1. *Fossitextura fugurativa* structure (*Thalassinoides*) in the Mottled Nodular Bed, Bara Simla, Jabalpur, M. P.
2. *Fossitextura fugurativa* structure (Burrow structure, *Thalassinoides*) in the Mottled Nodular Bed, Lameta Ghat, Jabalpur area, M. P.
3. *Fossitextura fugurativa* structure in the Mottled Nodular Bed, Bara Simla, Jabalpur area, M. P.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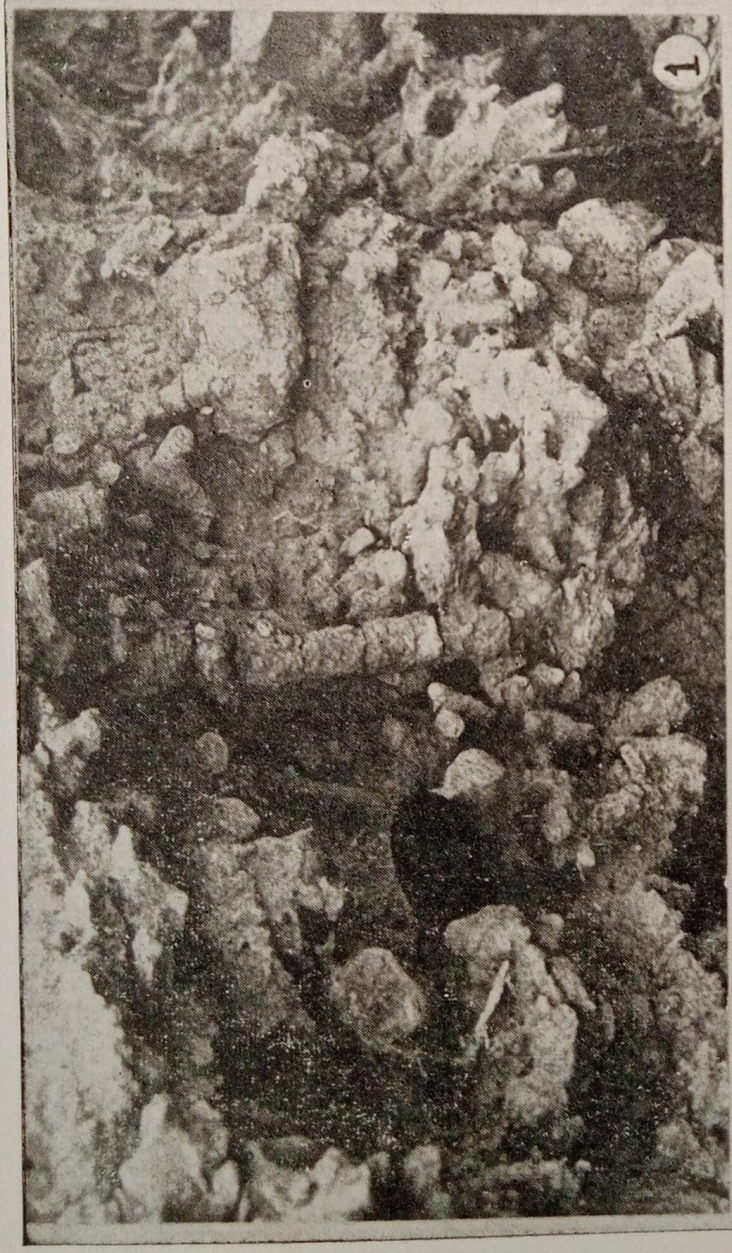
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