SHORTER COMMUNICATIONS

NEWER OBSERVATIONS ON THE STRATIGRAPHY OF THE BAGH BEDS

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Our recent work covering all the known outcrops of the Bagh beds has revealed that Deola-Chirakhan Marl of Bose (1884) is well developed, though in variable thickness, much beyond the limits of the Man river valley, as in Bowarla-Kherwan area to its east, to its north near Borghat on Zirabad Tanda road and about 6 km from Zirabad on the way to Amjhera, and to its west near Phata, Mahakal, Rampura etc. In all these sections it is highly fossiliferous yielding 60 out of the 120 molluscan species and 19 out of the 21 echinoid species recorded by us from the Bagh beds.

Besides its highly fossiliferous nature, the Deola-Chirakhan Marl has near its top a bed about 0.5 m to 1 m thick, characteristically rich in *Inoceramus*, numerically and varietally. Named for convenience of reference as Upper Inoceramus bed, it is particularly well seen in sections such as at about 0.5 km south of Chirakhan, near Sitapuri village, Deola, Badia-Chakrud and Bowarla-Kherwan.

By its highly fossiliferous nature and presence of the Inoceramus-rich bed near its top, the Deola-Chirakhan marl can be easily distinguished from the cream coloured marly material produced by weathering of the Nodular limestone; because this marly product occurs in pockets and is almost unfossiliferous; and if at all it happens to have inherited any fossils from its parent rock, the Nodular limestone, these fossils are a few ill preserved pelecypod shells, *Hemiaster* being characteristically absent, because *Hemiaster* is scarcely present in the parent rock. The presence of the Lower Coralline limestone coming between the Deola-Chirakhan marl and the Nodular limestone also shows that the Deola-Chirakhan marl could not be a product of weathering of the Nodular limestone.

Thus contrary to what Roy-Chowdhary & Sastri (1954; 1962) and Sahni & Jain (1966) have said, the Deola-Chirakhan marl is a definite and widely occurring constituent member of the Bagh beds, and not just a product of weathering of the Nodular limestone.

A section (Fig. 1A) across the highground in the north of Sitapuri tank may at first sight suggest that the Lower Coralline limestone of Rode and Chiplonkar (1935) on the two flanks is only the Upper Coralline limestone faulted down on the two sides. But this Lower Coralline limestone can be followed round the high-ground; also the Deola Chirakhan marl is not found below the Lower Coralline limestone as we follow it around the highground which it should have done if it was the Upper Coralline limestone that was faulted down. Thus faulting is precluded as the cause for the occurrence of the same Coralline limestone at different levels. The appearance of the Nodular limestone at a level higher than that of the Lower Coralline limestone, as can be seen from this section is, due to the unevenly eroded surface of the Nodular limestone of which the middle raised portion behaved like an island and the Lower Coralline limestone was deposited around it; the Deola-Chirakhan marl which was later deposited on this island extended laterally also and was succeeded by the Upper Coralline limestone. The Nodular limestone occurring

in this section below and also at a level higher than that of the Lower Coralline limestone, as at X in Fig. 1A, probably led Roy-Chowdhary & Sastri to interpret the Lower Coralline limestone as being a band within the Nodular limestone.

About 6 km from Zirabad on way to Amjhera and at Borghat nearly 3 km from Zirabad on the road to Tanda, we come across similar sections in which, however, the outcrop of the Nodular limestone is much less obvious than in the section north of Sitapuri tank (as at X in Fig. 1A). Sections in which the erosion surface of the Nodular limestone is still less uneven than in the sections referred to above, and therefore illustrating a simpler relation between the lower Coralline limestone and the Nodular limestone are met with near Badia, Sitapuri village, Chirakhan, Bowarla-Kherwan, etc. (Fig. 1B), and they show that the Lower Coralline limestone is an independent constituent of the Bagh beds and not just a band within the Nodular limestone as interpreted by Roy-Chowdhary & Sastri.

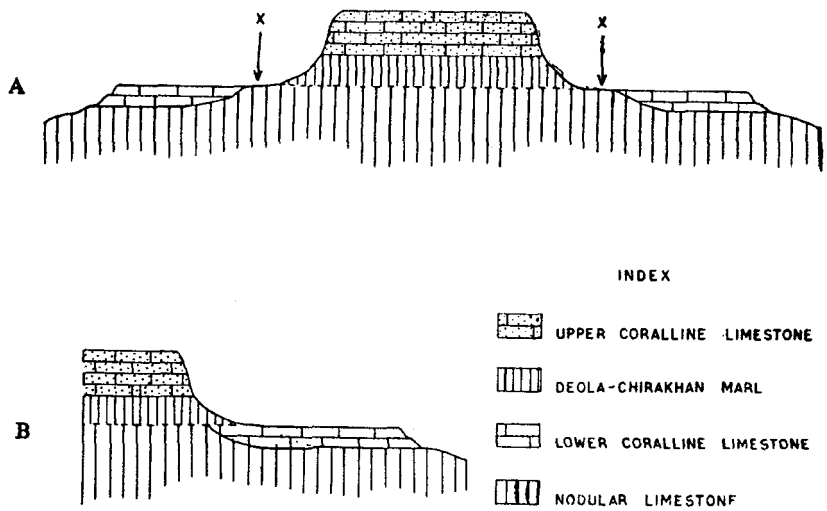

Figure 1. To show relation of Nodular limestone & Lower coralline limestone.

Thus the Coralline limestone comes at two distinct horizons, and like the Deola-Chirakhan marl which separates them, it also has a wide distribution extending much beyond the limits of the Man river valley.

The Nodular limestone hitherto considered poorly fossiliferous has, as a result of our recent field work, been found to be quite richly fossiliferous; out of 120 molluscan species now recorded by us from the Bagh beds, nearly 75 are found in this limestone. Fossils tend to get confined to the lower and upper portions, leaving the middle part, nearly 1 m to 5 m thick, almost devoid of fossils. A band nearly 0.5 m to 1½ m thick, in the upper part of this limestone is so rich in *Inoceramus*, numerically and vertically, that it can for convenience of reference, be called Lower Inoceramus bed. It is seen well exposed at Rampura, Padlya, Bagh and Mahakal.

These two Inoceramus beds (the Lower and the Upper) occurring at the top respectively of the Nodular limestone and the Deola-Chirakhan marl are here designated as such not for being treated as definite stratigraphic units in the Bagh succes-

sion, but to ensure that they are not lost sight of; future workers may see to what extent their status can be substantiated.

In the Nimar sandstone, just below the Bagh caves, is seen an Oyster bed 1 m to 2 m thick; and after a thickness of about 15 m or so, of barren sandstone, we get another Oyster bed a short distance to the west of the caves. This Upper Oyster bed is probably on the same horizon as the Oyster bed of Amlipura and the one at Moti Chikli, because at all these places they are only a metre or so below the local top of the Nimar sandstone, they are succeeded by the Nodular limestone and they contain shark teeth. At Phata an Oyster bed coming 3 m to 4 m above the local base (actual base not exposed) of the Nimar sandstone also probably corresponds to the Upper Oyster bed west of Bagh caves and the one at Moti Chikli; because a few shells of the same *Turritella* occur above them; while, a few stray shells of *Astarte* occurring below the Moti Chikli Oyster bed are like those of the Astarte bed (*vide infra*) coming over the Phata Oyster bed. The Oyster bed at Ghatia where it is succeeded by Coralline limestone may also be on the same horizon; but being far away from them, and for want of sufficient evidence at present, not much can be said about its horizon.

An Astrate bed, 3 m to 4 m thick, studded with shells of *Astarte* is seen within the Nimar Sandstone above the Oyster bed of Phata; it contains shark teeth, some *Turritella* shells, 2 cm to 4 cm long, and a few shells of *Protocardia*. Rapid decrease of the Oysters and increase of *Astarte* shells bring about the change from the *Oyster bed* to the *Astarte bed* within a thickness of about a metre or so.

The Oyster bed in the Nimar sandstone at Moti Chikli, after a metre and a half or two, is followed by a Turritella bed studded with shells of *Turritella* hardly more than a centimetre and a half long; it also contains oysters similarly small, but not abundant, and shark teeth; stray shells of *Astarte* like those of the Astarte bed of Phata, are seen a little below and in the Turritella bed.

Being far away from one another the relation between the Astarte bed of Phata and the Turritella bed of Moti Chikli is not clear; stray shells of *Astarte* below and in the Turritella bed, and the presence of *Turritella* shells in and above the Astarte bed coupled with the presence of shark teeth in both these beds, indicate a case of lateral variation being quite probable.

Further, in the Nimar sandstone of Amba Dongar area around Mongra, Moti Chikli, Khadlu, etc., some distance below the Oyster bed we find what looks like a definite horizon of shale-sandstone alternations; it has yielded a rich variety of Trace Fossils among which some air breathing arthropods of myriapod group are found along with marine and estuarine forms (Chiplonkar & Badve 1969; 1970).

Thus these horizons of the Oyster beds, the Astarte bed and the Turritella bed along with that of the Trace Fossils indicate that the fluviatile deposition of the Nimar sandstone had three or four marine interruptions.

As in thickness, the different members of the Bagh beds show variation in their gross nature also. To mention only briefly the more conspicuous features, the Nodular limestone is mostly nodular in the Bagh-Chirakhan area; but some times even in this area and elsewhere, it is primarily slabby and seen to become nodular on breaking and rounding along the close set joints. Further west in the Ali Rajpur and Amba Dongar regions, excepting in some sections as around Guneri, it tends to be more and more sandy, gritty and hard with loss of the slabby nature and the colour changing from cream to dark ochry brown. The Nimar sandstone, another most conspicuous member of the series, has false bedding as the only persistent

character, and shows considerable variation in the calcareous and shaly content, the colour changing from cream reddish to purplish red.

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STRUCTURE AROUND TIRODI, BALAGHAT DISTRICT, M.P.

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Introduction: Rocks around Tirodi, (21°41′15″N, 79°43′54″E) Balaghat district, M.P., belong to the Sausar series. They include rich deposits of manganese ores confined to the gondites which represent metamorphosed manganiferous argillaceous and arenaceous sediments. The stratigraphic succession of the Sausar series suggested by Straczek *et al.* (1956) is given below along with the local sequence observed by the present author.

Sausar Series		Local sequence
Bichua Formation Junawani Formation Chorbaoli Formation	.....	Muscovite schist, biotite schist with epidote granulite
Mansar Formation	.....	Sillimanite bearing quartz muscovite schist with quartzite and gondites.
Khadbikera Formation Tirodi Biotite Gneiss	.....	Biotite gneiss, granite gneiss, amphibole gneiss, felspathic gneiss etc.

Broad structural studies of the Sausar series were carried out by Fermor in 1909. Straczek *et al.* (1956) mapped the whole belt and concluded that these rocks have been affected by several periods of folding and faulting. Roy (1958) carried