



ON THE REPORT OF THE SMALL SHELLY FOSSILS AND BRACHIOPODA FROM THE VINDHYAN STRATA

D. K. BHATT

GEOLOGICAL SURVEY OF INDIA, JAIPUR-302 004

ABSTRACT

The Vindhyan Supergroup forms a basic reference sequence for a host of Proterozoic basins in India and has a well-established stratigraphic position in the Meso-Neoproterozoic based on numerous investigations on its carbonaceous microfossils, stromatolites and geochronological data. Report of age-specific small shelly fossils (SSF) and brachiopods from the Vindhyan strata of the Semri Group by implication puts the major part of the Vindhyan succession in Palaeozoic. It, therefore, became essential to critically examine the veracity of the claim in order to sort out the controversy resulting out of the report. A team of geologists from Geological Survey of India followed by a joint investigation team of the VINDHYAN WORKSHOP (University of Lucknow, 19-20 March, 1999) studied all aspects of fauna as well as field setting. The results obtained by both the teams were similar, in so far the non-biogenic nature of the reported fossils was concerned. The teams also brought out grave inaccuracies in regard to field observations as contained in the fossil report. A redeeming feature of the entire exercise, at the end, is the emergence of an unequivocal inference that the great Vindhyan succession of Peninsular India remains tied to the Meso-Neoproterozoic time slot and continues to form reference for Proterozoic sequences in the Indian Peninsula as before.

Key words: SSF, Brachiopoda, Rhotasgarh Limestone, Lower Vindhyan, Central India.

INTRODUCTION

The recent metazoan fossil report from the Vindhyan strata and its subsequent culmination in the negation of the said discovery after repeated re-investigations in field and laboratory, started with the report of the presence of small shelly fossils (SSF) and brachiopoda in the Lower Vindhyan strata (Rohtasgarh Limestone Formation) of the Semri Group (Azmi, 1998). The reported fossils included SSF elements - *Spirellus shankari*, *Olivoides multisulcatus*, *Codonoconus* sp., *Taliella* n. gen., *Camenella* sp., *Lapworthella* sp. and *Halkiedria* sp., along with small-sized acrotretid and obolellid inarticulate brachiopods from two, far-separated sections in the Vindhyan terrain – Badanpur section (near Maihar, M.P.) and Ramdihra Quarry section (near Rohtasgarh, Bihar). According to the author (Azmi, 1998), the fossil assemblage indicated an age-range of Tommotian-early Atdabanian, in the pre-trilobite Early Cambrian time-frame – well within the Palaeozoic Era, for the greater part of the Vindhyan succession.

Based on the report, the author (Azmi, 1998) concluded/suggested:

i) “the Vindhyan Basin should not be referred to as the ‘Proterozoic basin’ but as ‘Terminal

Proterozoic to Early Palaeozoic basin’, ii) the PC-C boundary lay in the uppermost strata of the Rohtasgarh Limestone in the Semri Group of the Lower Vindhyan, iii) ‘Blaini Conglomerate’ of Krol basin in Lesser Himalaya was correlatable with ‘Basal Conglomerate’ of Vindhyan Basin of Peninsula, iv) there was a distinct possibility of the presence of Ediacaran soft-bodied metazoan fossils in the older sediments of the Semri Group, v) absence of Early Palaeozoic marine fossils in the Upper Vindhyan was due to its continental character, vi) there was “an urgent need for re-evaluation of the stromatolites and the micro- and macrobiota (especially the *Chuarina-Tawuia* assemblage) which are reported to occur in the Lower as well as the Upper Vindhyan and form the main basis of assigning Riphean age”, vii) the extant geochronologic data for the Vindhyan in the time-span of Proterozoic was questionable and viii) the Pokharan Boulder Bed at the base of Marwar Supergroup (=Trans-Aravalli Vindhyan of Azmi, 1998), ‘Blaini Conglomerate’ of Lesser Himalaya and the ‘Basal Conglomerate’ of the Vindhyan succession were “event markers at the beginning of the Vendian time (650 Ma)”.

These undoubtedly epoch-making conclusions/suggestions, in gross contrast to the established concepts of Peninsular and Himalayan stratigraphy, brought the fossil discovery in immediate sharp focus. Many past workers of Vindhyan geology as well as those academically interested in it felt thrilled, with a sense of awe, on the announcement of the report (*Jour., Geol. Soc. India*, v. 53, January, 1999, pp. 120-125) and appeared to accept broadly the discovery and the consequent conclusions, at best, seeking only minor clarifications here and there. However, a critical field and laboratory study shortly thereafter (Bhatt *et al.*, 1999), revealed the nonbiogenic nature of the reported 'microfossils'. By that time Azmi (1999a) had also withdrawn his earlier claim of the presence of brachiopod in the Semri material (Azmi, 1998). By April, 1999, the active workers in the field of Vindhyan geology began to express their dissidence to the report (*Jour., Geol., Soc. India*, v. 53, April, 1999, pp. 481-488).

Although in his second attempt Azmi (1999c) claimed a still better recovery of 'microfossils' from the Badanpur material, the thrill of the 'discovery' practically died down because of the proven non-biogenic nature of the 'microfossils'.

EXAMINATION OF THE REPOSITED MATERIAL

The present author examined the repositated material of Azmi (1998, Plates 1 & 2) on 18th to 20th November, 1998, in the Wadia Institute of Himalayan Geology, Dehra Dun, being deputed by Geological Survey of India (GSI) to do so.

The original specimens (not latex casts) of "inarticulate brachiopods" recorded by Azmi (1998, Pl. 1, figs. 1-8 & 12) from the Ramdihra Quarry section were found not to represent brachiopod fossils on several counts (see Bhatt *et al.*, 1999), which were discussed with Dr. Azmi, who later (Azmi, 1999a) appeared to have arrived at the same conclusion, but of his own, supposedly on different counts. In a communication dated 23rd November, 1998, the author formally informed GSI regarding his observations on "brachiopod" fossils. In regard to

other repositated microfossils, SEM coated as they were, it appeared difficult to build a firm opinion on their biogenicity without the observable details of their surface features and shell wall. Except for their general shape, size and dimensions, which matched rather well with SSF, the chemical composition of the illustrated material was also not available then (*Pers. comm.*, Dr. R. J. Azmi, 18th November, 1998). Many specialists (Ravi Shanker, GSI; Prof. S. Kumar, University of Lucknow), who had already examined the material, expressed their skepticism about the biogenicity of the illustrated elements (*Pers. comm.*, November, 1998).

RESULTS OF FIELD INVESTIGATIONS

The initial announcement of the fossil report, supposedly a profound one, strangely did not contain details of locations of the fossil-yielding sections. Probably, the author intended "to keep certain 'cards' close to his chest" (Bhatt, 1999, p. 122).

In a later publication (Azmi, 1999a), the author belatedly revealed the location map and details of the 'fossiliferous' sections, which were visited and re-examined on two occasions – first by a team exclusively from GSI (17th to 24th January, 1999; Bhatt *et al.*, 1999) and later by a joint investigation team nominated by the **Workshop on Vindhyan at the University of Lucknow (21st to 24th March, 1999)**. The observations of the two teams are in complete conformity with each other, as briefly given below :

A. Badanpur Section (Near Maihar, M.P.)

- i) The major lithology consists of cherty shale/cherty siltstone/procellanite. The "Thinly bedded light grey cherty limestone" referred to by Azmi (1999a, fig. 3) as the major constituent lithology of the exposed section is conspicuously absent.
- ii) No evidence of biogenic activity (algal or trace) is observed.
- iii) The exposed sequence belongs to the Bhagwar Shale Formation rather than the Rohtasgarh Limestone Formation as expressed by Azmi (1999a, fig. 3).

B. Ramdihra Quarry Section (Near Rohtasgarh, Bihar)

- i) The Rohtasgarh Limestone sequence in the quarry is not immediately overlain by "Current bedded sandstone" of the Kaimur Group as shown by Azmi (1999a, Fig. 5), but is separated from the latter by at least a 30 m thick, light-density shale sequence. This shale sequence that overlies the Rohtasgarh Limestone and underlies the Kaimur Sandstone appears to be equivalent to the Bhagwar Shale Formation of the Badanpur section of the Maihar area (ref. Bhatt *et al.*, 1999, fig. 2), although in the available maps of the Rohtasgarh area this stratigraphic unit is not differentiated. This lithological unit in the Semri succession of the Rohtasgarh area altogether escaped the attention of Azmi (1999a, Fig.5). Additionally, the uppermost unquarried portion of the Ramdihra section, exposing the topmost part of the Rohtasgarh Limestone, was presumed by Azmi (1999a, Fig. 5) to represent the "Current bedded sandstone" of the Kaimur Group, apparently without physically examining that part of the section.
- ii) The limestone strata in the quarry section are observed to enclose algal mats, small-sized spheroidal to cone-shaped algal bodies and/or secondarily grown minerals, mostly siliceous in composition. Many such features (but not all) superficially resemble the small-sized Early Cambrian brachiopods on a casual look, along the bedding surfaces. Sometimes, lime-mud pellets also contribute to this confusion.

Comparing and collating the observations in the above two sections, the joint investigation team unequivocally inferred that (see also Bhatt *et al.*, 1999) :

- i) in the Badanpur section, Azmi (1999a, Fig.3) mistook cherty shale/cherty siltstone/porcellanite for "Thinly bedded light grey cherty limestone".
- ii) the Badanpur sequence belongs to the Bhagwar Shale Formation (of the Semri group) and not to the Rohtasgarh Limestone Formation as

shown by Azmi (1999a, fig.3).

- iii) the two exposures of the Semri strata are not correlatable, as presumed by Azmi (1998), and display two different formations of the Semri Group – the Badanpur sequence (i.e. Bhagwar Shale Formation) being younger than the Ramdihra Quarry sequence, i.e. Rohtasgarh Limestone Formation. In this context, it may be recalled that 'bio-' and 'chronostratigraphic' deductions made by Azmi (1998) led him to infer that the Ramdihra section instead, was younger than the Badanpur section which was in contradiction to the factual field observations.
- iv) the members of the joint investigation team, while examining the Badanpur section on 22nd March, 1999, unanimously concluded that the overwhelmingly siliceous succession was not amenable to extraction of 'microfossils' by acid maceration, a question that has been raised later also by others (Brasier, 1999; among others).

Azmi (1999c) withdrew his claim about the presence of cherty limestone in the Badanpur section and appeared to agree with the observations on the field geological set-up of the two referred sections put forth by the GSI team (Bhatt *et al.*, 1999) and later unanimously endorsed by the joint investigation team.

The elaborately depicted "Current bedded sandstone" forming the topmost part of the lithocolumn in the Ramdihra Quarry (Azmi, 1999a, fig.5), speaks of the casual and presumptuous approach to field observations in the section of the Ramdihra Quarry. The part of the section under present discussion is made up exclusively of a limestone succession, as stated earlier in the text.

Both the GSI and the joint investigation teams were equipped with Shapiro's solution for testing the presence of phosphatic sediments in the field. Shapiro's tests indicated conspicuous absence of such sediments on both the occasions.

RESULTS OF THE LABORATORY INVESTIGATIONS

The laboratory examination of the samples collected from the Badanpur and the Ramdihra

Quarry sections was carried out by the GSI team and preliminary results were presented on 20th March, 1999, at the workshop on Vindhyan in the University of Lucknow and later published (Bhatt *et al.*, 1999). The elaborate exercise carried out then proved conclusively that the samples (including those from the specific stratigraphic levels described as fossiliferous by Azmi, 1999a) were found to be characterised by the absences of organic remains. It was also found that a particular level in the Ramdihra Quarry section yielded in profusion tiny secondary silica growth structures on maceration with usual 10% acetic acid which, when camouflaged with SEM coating, could be easily mistaken for elements of SSF. These minute artefacts were picked in the sieve-mesh range of 30-80.

A second phase of microscopic examination was carried out when the samples were collected by the joint investigation team (Dr. Azmi was one of the participants) and supplied to the author. The samples collected from the Badanpur section were absolutely non-reactive to the acid treatment on maceration and produced very small quantity of the powdery residue for microscopic examination. The recovered residue was examined this time in 30-150 sieve-mesh size, however, with negative results as before. The samples examined from the Ramdihra Quarry section did not yield organic remains the second time also.

CONCLUDING REMARKS

Some of the conclusions drawn at the workshop on Vindhyan stratigraphy and palaeobiology may be reiterated (ref. Kumar, 1999) :

- i) "The palaeontological findings should always be published with location map and lithology" to enable the interested workers to reproduce the new finds for their study.
- ii) "Identification of the fossils should be first confirmed and expert opinion taken before publishing the findings". In the present case, the author (Azmi, 1991a, pp. 127-128) was skeptical of the identification of 'brachiopoda'. Seeking opinion of co-workers in the first stage (before publishing) would have helped and saved him from the retraction of his the own

identification later. In addition, this misinterpretation may have made him biased towards putting the Ramdihra level younger than the Badanpur level, where such artefacts ('brachiopoda') were not found – an inference that does not withstand the observations on the exposed stratigraphical set-up in the field.

- iii) From ii), it emerges that a well-researched stratigraphic framework was not put in place by the author (Azmi, 19998) prior to his 'palaeontological inputs' to the lithocolumns on Lower Vindhyan. Unfortunately, based upon such casual approach and poorly observed field data, the sweeping changes in the subcontinental stratigraphy were proposed.

Sustained claim of the presence of 'microfossils' by Azmi (1999c) in the Badanpur section (not of the Ramdihra Quarry section anymore) which, however, exposes lithologies least suited to the usual maceration by acid treatment for extracting SSF, appears to be related to the possibility of persistent misinterpretation.

The ideal host for preserving SSF elements, such as *Spirellus shankari*, *Olivoides multisulcatus*, etc., which occur in profusion in the Chert-Phosphorite Member of the Tal Formation, Lesser Himalaya (Bhatt *et al.*, 1983, 1985), is formed by phosphatic lithofacies which remains undetected in the Lower Vindhyan sections that were examined by us.

ACKNOWLEDGEMENTS

The author is grateful to Dr. S.K. Acharyya, Director General, and Shri Ravi Shanker, Senior Deputy Director General, Geological Survey of India (GSI), for assigning this scientific investigation to him and for providing necessary facilities. Shri B.D. Dungrakoti, Deputy Director General, GSI, scrutinised this write-up, for which the author is thankful to him. The author also wishes to acknowledge the close co-operation received from the members of the GSI team.

REFERENCES

- Azmi, R.J. 1998. Discovery of Lower Cambrian small shelly fossils and brachiopods from the Lower Vindhyan of Son valley, Central India. *Jour. Geol. Soc. India*, **52**: 381-389.
- Azmi, R.J. 1999a. Discovery of Lower Cambrian small shelly

- fossils and brachiopods from the Lower Vindhyan of Son valley, Central India. Discussion. *Jour. Geol. Soc. India*, **53**: 488-500.
- Azmi, R.J.** 1999c. Discovery of Lower Cambrian small shelly fossils and brachiopods from the Lower Vindhyan of Son valley, Central India. Discussion. *Jour. Geol. Soc. India*, **53**:730.
- Bhatia, S.B.** 1999. Discovery of Lower Cambrian small shelly fossils and brachiopods from the Lower Vindhyan of Son valley, Central India. Discussion. *Jour. Geol. Soc. India*, **53**:121-122.
- Bhatt, D.K., Mangain, V.D., Misra, R.S. and Srivastava, J.P.** 1983. Shelly microfossils of Tommotian age (Lower Cambrian) from Chert-Phosphorite Member, Tal Formation, Maldeota, Dehra Dun district, U.P. *Geophyt.* **13**: 116-123.
- Bhatt, D.K., Mangain, V.D. and Misra, R.S.** 1985. Small shelly fossils of Early Cambrian (Tommotian) age from Chert-Phosphorite Member, Tal Formation, Mussorie Syncline, Lesser Himalaya, India and their chronostratigraphic evaluation. *Jour. Pal. Soc. India*, **30**:92-102.
- Bhatt, D.K., Singh, G., Gupta, S., Soni, M.K., Moitra, A.K., Das, D.P. and De, C.** 1999. Fossil report from Semri Group, Lower Vindhyan, *Jour. Geol. Soc. India*, **53**: 717-723.
- Brasier, M.** 1999. Discovery of Lower Cambrian small shelly fossils and brachiopods from the Lower Vindhyan, small shelly fossils and brachiopods from the Lower Vindhyan of Son valley, Central India. Discussion. Deep questions about Vindhyan fossils. *Jour. Geol. Soc. India*, **53**:717-723.
- Brasier, M.** 1999. Discovery of Lower Cambrian small shelly fossils and brachiopods from the Lower Vindhyan of Son valley, Central India, Discussion. Deep questions about Vindhyan fossils. *Jour. Geol. Soc. India*, **53**: 727-730.
- Kumar, S.** 1999. Report on the "Workshop on Vindhyan Stratigraphy and Palaeobiology" (March 19-20, 1999). *Jour. Pal. Soc. India*, **44**: 151-153.

Manuscript Accepted April 2003

