

## COMMENT

### Environment and age of the Tal Formation of Mussoorie and Nilkanth areas of Garhwal Himalaya

(by Indra Bir Singh, published in the Journal of the Geological Society of India, Vol. 20, No. 5, pp. 214-225).

The comments mainly relate to the inferred Precambrian age for the Tal Formation. Singh has mainly analysed the fossiliferous Tal shell-limestone of Jurassic-Cretaceous age occurring at the top of the Tal succession and Carboniferous-Permian marine fauna closely associated with the Tal Formation of Garhwal synform. But he has ignored microfossils associated with the phosphorite bearing Lower Tal. The rocks yielding Late Palaeozoic fauna and corresponding to the Bijni tectonic unit overriding the Krol-Tal succession has been rightly excluded from the Tal Formation. The fossiliferous Tal shell-limestone (named as 'Nilkanth Formation' by Singh) has been inferred to unconformably overlie the subjacent section of Tal which was regarded as the 'Tal Formation' proper, by Singh.

Exclusion of 'Tal shell-limestone' from the underlying 'Tal' was also advocated by us but for different reasons (Acharyya and Ray, 1979). In Garhwal Himalaya, the 'Tal shell-limestone' with sporadic but consistent late Jurassic-Cretaceous microfossils occurs in two structural levels, i.e. (i) in between the 'Tal' and the overlying Subathu and (ii) unrelated to the 'Tal', within the infra-Blaini 'Shankarpur' tectonic unit (Dhondiyal and Kumar, 1976). The latter represents tectonically mixed-up zone within the Simla Group and the Paleogene rocks at the variably truncated base of Nagthat-Blaini-Krol-Tal succession (Krol nappe) of the Garhwal and Mussoorie synforms. Along the frontal zone, the 'Shankarpur' tectonic mélange overrides the Siwalik.

Microfossil assemblage from the two structural levels of the 'Tal shell-limestone' is very similar and typically lacks late Palaeozoic algae or other elements (cf. Mehrotra *et al.*, 1976). A few generic names from the lower unit assemblage from Binj river and Shankarpur hillock ( $30^{\circ}10' : 78^{\circ}14'$ ) are listed below (identification by M. K. Sen and R. N. Ghosh, Central Palaeontological Laboratory, GSI, Calcutta): Forams: \**Schizommina*, \**Bathysiphon*, \**Quinquiloculina*, *Cibicides*, *Nautiloculina oolithica*; Algae: *Neomeris*, *Lithothamnium*, *Boueina*; Bryozoa: *Laterocavea*, other forms, Ostracods etc., (asterisked forms are recorded from the upper unit at Tal-Binj confluence, *Neomeris*, *Laterocavea* are also reported from the upper unit). The assemblage indicates upper Jurassic to Cretaceous age.

In the Binj river section, the Krol-Tal sequence is truncated except the upper and the lower 'Tal shell-limestones' which are separated by purple crimson flyschoid beds corresponding possibly to the Simla/Paleogene rather than the Blaini as usually believed. At the Tal and Binj river confluence the type 'Tal shell-limestone' is only exposed overlain by Subathu. In Tal valley further up the overriding Amri phyllites are exposed.

Lithologically and faunistically similar 'Tal shell-limestone' underlying Subathu type shales also occurs at the truncated base of the Krol succession of Nainital area further east. The faunal assemblage is under study.

The 'Tal shell-limestone' thus should be excluded from the so called 'Tal' and grouped with the Paleogene sediments with which it is naturally associated and biostratigraphically better related. The name 'Tal' for the remaining clastic sequence overlying the Krol and underlying the 'shell limestone' is also a misnomer since these are not exposed in the type Tal valley.

Apart from these fossil horizons which ought to be excluded from the 'Tal', sporadic fossils have also been recorded from the lower Tal associated with phosphorites. Except Patwardhan, others have broadly advocated Mesozoic age for the lower Tal. Fossils belonging to Order Moravamminida recorded within the Mussoorie phosphorites are claimed to be Late Palaeozoic index fossils and unknown from rocks younger than the Permian. On the contrary, organic records from the same collection are believed to contain rich algal assemblage of Jurassic-Cretaceous age according to A. D. Ahluwalia (Pers. Comm. O. N. Bhargava, Seminar Correlation of Lesser Himalayan formations; Kumaun University, Nainital, April, 1979). These microfossils thus require close critical study. Their age controversies notwithstanding these fossil records collectively speak against inferred Precambrian age of the Tal by Singh (1979). Instead Singh indirectly cites occurrence of phosphorites as a criterion for Precambrian age of the Tal and the Krol.

Singh has similarly discarded evidences provided by sporadic records of microfossils associated within the subjacent Krol-Infra-Krol-Blaini-Nagthat. Marine microfossil occurrences of various ages within this succession are accounted as repeated localised marine transgressions over essentially unfossiliferous Precambrian tidal platform sequence. It is difficult to visualise how under such condition these fossiliferous horizons can acquire broadly organised stratigraphic positions within the Nagthat to Tal succession.

Thus based on available stratigraphic evidences neither the so-called 'Tal Formation' nor the sequence Nagthat to Tal can be considered to be Precambrian in age.

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#### AUTHOR'S REPLY

I am glad to receive comments by Dr. S. K. Acharyya on my paper on Tal Formation, in which some unorthodox views have been expressed.

The separation of 'Tal shell-limestone' (Nilkanth Formation of Singh, 1979a) from the underlying rest of the Tal succession was first proposed by Singh (1976), and later documented by the petrological evidence (Singh, 1979b). This also led me to suggest a new sedimentological evolutionary model for Himalaya (Singh, 1976; 1979c).

It is interesting to note that Acharyya also wants to separate 'Tal shell-limestone' from the underlying Tal; however, he has not specified whether he thinks that there is some sedimentation break below the 'Tal shell-limestone'. He has also not outlined the reasons and evidences for separating 'Tal shell-limestone' from the underlying Tal, which would have been welcome. However, grouping of 'Tal shell-limestone' with Subathu sediments which sometimes overlie it, is not feasible at the present state of investigations. Firstly, 'Tal shell-limestone' makes an independent mappable unit, secondly it is sometimes associated with Infra-Blaini sediments (Shankarpur tectonic unit of Dhoundiyal and Kumar, 1976), thirdly, there seem to be more than one band of shell-limestone, and one of them, at least, is regarded to yield Permian fauna, and lastly, there is meagre information about the sedimentological and palaeontological changes between 'Tal shell-limestone' and the overlying Subathu sediments. Acharyya does not specify whether there is any palaeontological evidence to consider the purple sediments in Binj River section as Palaeogene. Thus, at present, it is better to consider 'Tal shell-limestone' as an independent unit. Though, there is a strong possibility that 'Tal shell-limestone' and the overlying Subathu sediments make an integral succession, representing deposition from a major transgression during Cretaceous which continued up into Eocene.

As commented by Acharyya, the name Tal may be a misnomer for the lithological sequence below the 'Tal shell-limestone' and above the Krol carbonates, because originally the name Tal was proposed for 'Tal shell-limestone' (Middlemiss, 1887). The name Tal however, is very deep-rooted in the stratigraphy of Lesser Himalaya and it is better to retain the name Tal Formation for the sediments overlying the Krol carbonates, and give a new name to 'Tal shell-limestone', e.g. Nilkanth Limestone in Nilkanth area.

Acharyya criticizes that I have ignored the fossil reports from the Lower Tal sediments and quotes several references where fossils have been reported from the lower Tal sediments. I am not very sure how systematically and critically Acharyya has gone through these reports. In the following, I shall give short comments on these fossil reports, which have led Acharyya to believe that the 'Tal may be Palaeozoic or Mesozoic (or may be Palaeozoic to Mesozoic), but is certainly not Precambrian'.

Shrivastava and Mehrotra (1974) have given only an abstract, reporting some fossils from Tal Formation. This report can, at the most, be considered as an evidence of presence of organic remains in Tal. Organic remains are present in Late Precambrian rocks throughout the world.

Srivastava (1974) reports conodont of probable Triassic age, without adequate fossil assemblage, palaeoecology etc. However, hundreds of samples from the same locality have been systematically disintegrated to obtain conodonts, but no conodonts were found (personal comm. Dr. A. Sahni). Thus, it can be a case of contamination. Further, conodonts have been reported from the Precambrian of U.S.S.R. (Bengtson, 1976; Missarzhevskij, 1973). Consequently, this report is not any evidence of Mesozoic age of Tal.

Shrivastava (1972) records lamellibranchs from Lower Tal Shale which he identifies as *Posidonia cf. Ornati Quenist, 1851*, giving a Jurassic age to lower Tal. Shrivastava describes them as 'few disc-shaped shells', '.....in the form of internal cast or mould', '.....2.5 to 3 mm in size', '.....appears to be composed of carbonaceous and chitinous material'. His illustration depicts a small disc-like body showing concentric and radial lines. However, more significant features, e.g. muscle impressions, hinge, umbo etc., are not illustrated.

The comparison of these disc-like bodies with *Posidonia* is not feasible, because (i) *Posidonia* is much larger in size (1-3 cm), (ii) there are shape differences, (iii) the identification of moulds on generic and specific level is not possible.

This occurrence can at best be considered a report of minute shell-like bodies with prominent ornamentation. These bodies show better comparison with primitive brachiopods or lamellibranchs of phosphatic and chitinous nature. In the Late Precambrian sediments possibilities exist of finding primitive brachiopods.

Patwardhan (1978) describes from the Lower Tal sediments some organic remains, which he assigns to the family Moravaminidac, hence can not be younger than Permian, thus age of the Lower Tal becoming upper Palaeozoic. Interestingly, from the same locality and samples Ahluwalia (1978) also describes organic remains which he assigns to Foraminifera and Porifera and later regards them to be of Jurassic-Cretaceous age on the basis of algae.

These reports too give evidence of organic remains in the Tal Formation, but their age validity is highly questionable, considering that the same samples yield fossils of late Palaeozoic and late Mesozoic age, certainly a palaeontological impossibility.

If we sum up the fossil record of the Lower Tal sediments, it suggests, that there is much evidence of life; and organic remains especially the algae (stromatolites) is quite abundant. Further, other primitive type of organic remains are present, which have been referred to as Palaeozoic or Mesozoic forms. There is no reason why these organic remains cannot be considered as Late Precambrian in age (near the Precambrian-Cambrian transition).

Acharyya rejects the Precambrian age for Tal Formation; however, he does not give any comments on how it is possible to explain fossils of Late Palaeozoic age and Late Mesozoic age in a single horizon? or how a haphazard distribution of fossils (?) in a continuous sequence of Krol belt is possible?

I do not want to be dogmatic in my views of Precambrian age of Tal or Krol belt sequence in general. However, any fossil report has to be properly scrutinized. From the available information, the Precambrian age for Krol belt is certainly a better working hypothesis than assigning some speculative ages to different lithounits of Krol belt.

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## ANNOUNCEMENT

### THIRD INDIAN GEOLOGICAL CONGRESS

26th to 29th December, 1980

#### *First Circular*

The third session of the Indian Geological Congress will be held at Pune from 26th to 29th December, 1980 under the auspices of the University of Poona.

It is proposed to hold sessions covering the following themes :

- 1) Precambrian Geology. 2) Indian Stratigraphy, Palaeontology and Palaeoecology. 3) Structural Geology and Tectonics. 4) Ore and Mineral Deposits. 5) Mineralogy, Petrology and Geochemistry. 6) Marine Geology and Sedimentology. 7) Geomorphology and Quaternary Geology. 8) Hydrogeology and Engineering Geology. 9) Prospecting and Remote Sensing. 10) Miscellaneous.

A special session on 'Geochemistry and Tectonics of the Deccan Traps' is being arranged in which invited papers will be presented and will be followed by discussion.

It is proposed to hold a post-session field trip around Pune on 29th December, 1980.

Abstracts of papers to be presented at the Congress should be sent to the Organising Secretary, 3rd Indian Geological Congress, C/o Department of Geology, University of Poona, Pune-411 007, by 31st December, 1979. Full papers (in duplicate) complete in all respects, should reach the organisers by 31st March, 1980. Authors should strictly follow the format of the *Journal of the Geological Society of India*. Papers, after editorial scrutiny, and re-submission in revised form (if necessary), will be pre-printed and will be available for sale at the registration counter. It will not be possible to publish papers received after 31 March, 1980, though they may be presented at the Congress.