Terminal Proterozoic Events from the Krol Belt, Lesser Himalaya, India –

A Review

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The terminal Proterozoic marine sequence represented by the Baliana and Krol groups is well exposed in the Krol Belt of Uttaranchal and Himachal Pradesh, Lesser Himalaya, India. The Baliana Group lies unconformably over the Simla Group (Early Neoproterozoic) and is conformably overlain by the Krol Group and Early Cambrian Tal Group. The Baliana Group is divisible into the Blaini Formation, represented by diamictite and arenaceous facies with bands of carbonate and the Infra Krol Formation consisting of pyritous argillaceous facies. The Baliana Group may be equivalent to Marinoan/Varanger/Nantau glacial deposits. The Krol Group is essentially a carbonate–evaporite sequence. The overlying Tal Group is argillaceous with development of thick black chert with or without phosphorite in the lower part, whereas the upper part is dominantly arenaceous. The Baliana Group of rocks yields a biota of cyanobacteria belonging to Synaplomorphitae and Nematomorphitae as well as acritarchs belonging to sphaeromorphids and sphaerohystrichomorphids, and simple, stratified type stromatolites which are also known from the terminal Neoproterozoic rocks in other parts of the world. The Krol Group has yielded Ediacaran biota represented by Kimberella, Beltanella, Tirasiana, Medusinites, Nimbia, Conomedusites, Cyclomedusa, Iridinitus, Dickinsonia and Beltanelliformis and frondoids viz. Charniodiscus and Pteridinium indicating a Terminal Proterozoic age (600-550 Ma). The cyanobacteria, acritarchs, microphytolites, oncolites, catagraphs, vendotaenid algae, calcareous algae, stromatolites and trace fossils recorded from the Krol Group are correlateable with the
biota of Terminal Proterozoic rocks of the other parts of the world. The large-sized acanthomorphs recorded from the Infra Krol and Mahi (Lower Krol) formations are known globally, postdating the Varanger glaciation and predating the diversification of the Ediacaran biota. The basal part of the Tal Group has produced Early Cambrian small shelly fossils (SSF), acritarchs, cyanobacteria and stromatolites. This biota suggests a tidal flat environment of deposition of the sequence.

As per recommendations of IUGS subcommission on the Terminal Proterozoic System, the initial Global Stratotype Section and Point (GSSP) for this System has been proposed at the base of Nuccaleena Formation cap carbonate, immediately above the Elatina diamictite in Enorama Creek Section, Flinders Ranges, South Australia (18th Circular of IUGS, September, 2003). In the Krol Belt, Lesser Himalaya, a significant depletion in $\delta^{13}$C values in the pink carbonate (cap carbonate) of the Blaini Formation has been recorded. This depletion may be taken to mark the lower boundary of the Terminal Proterozoic System (Knoll and Walter, 1992). In the absence of trace fossils of Zone - I (Harlaneilla podolika Zone) and Zone - II (Phycodes pedum Zone) in the Baliana- Krol succession of the Krol Belt, the upper boundary of the Terminal Proterozoic (Precambrian - Cambrian boundary) can not be demarcated in the terms of Global Stratotype Section and Point (GSSP). However, a significant depletion in $\delta^{13}$C values has been recorded in the carbonate facies of Krol Belt between the horizon yielding Ediacaran biota and small shelly fossils of Meishucanian Zone– I. This depletion may be correlated with that recorded from the Precambrian- Cambrian transition in other parts of the world. (Knoll and Walter, 1992). It may be taken to define and mark the upper boundary of the Terminal Proterozoic in the absence of trace fossils.

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