Arthropod from the Bikaner–Nagaur Basin, Peninsular India

Fossil trilobites belonging to the order Arthropoda are well known from the Cambrian successions of the Tethyan and Lesser Himalayan regions of the Extra-peninsular India[1]. Only recently, the presence of trilobite in the form of trace fossils has been documented in the Peninsular part of the country in the Nagaur Sandstone Formation (Marwar Supergroup) of the Bikaner-Nagaur Basin in Rajasthan[2–5]. A thorough search has led to the discovery of a poorly preserved arthropod from the Nagaur Sandstone Formation (Figure 1 *a*).

The Neoproterozoic to Early Cambrian Marwar Supergroup is lithostratigraphically divisible into Jodhpur, Bilara and Nagaur Groups in ascending stratigraphic order[6–9] (E. A. Khan, unpublished). The Jodhpur and Nagaur Groups comprise predominantly siliciclastic rocks, whereas the Bilara Group is dominated by carbonates and evaporites. The delineation of the Precambrian–Cambrian (Pc–C) boundary in Marwar Supergroup is controversial. Based on carbon isotopic studies glaciation inferred at the end of Neoproterozoic, and the Pc–C boundary was placed in the basal part of the Goten Limestone (Bilara Group)[10–12]. These authors mentioned that the cold climatic conditions were followed by warmer conditions as indicated by positive shift in carbon isotope value. The above interpretations were not supported by sedimentological studies[9]. It has also been suggested that the Pc–C boundary may lie in the phosphortie deposit of the Birmania Formation (= Jodhpur Group) in the Birmania Basin[9] (western part of the Rajasthan shelf). More recently, it has been stated that the similarities of carbon isotope oscillation in Bilara carbonate sequences and lower Cambrian carbonate sequences from different parts of the world indicate that Bilara carbonates were most likely deposited during early lower Cambrian (Nemakit–Daldynian)[12].

The Nagaur Group represents the youngest sequence of the Marwar Supergroup in western Rajasthan. It is predominantly composed of siliciclastic rocks divisible into the Nagaur Sandstone and Tunkliyan Sandstone formations. The Nagaur Sandstone Formation is exposed only in the quarry face of the Dulmera mine. It is a red silty-sandstone with well-preserved trace fossils represented by *Rusophycus*, *Diplichnites*, *Dimorphichnus*, *Monomorphichnus*, *Treptichnus*, *Bergaueria*, *Planolites* and *Paleophycus* together with abundant burrows referable to *Cruziana*[2–5]. The present correspondence records a single poorly and partially preserved specimen of an arthropod from the micaceous silty-sandstone horizon of the Nagaur Sandstone Formation exposed 9.7 m above the base of the 19-m deep red sandstone quarry at Dulmera village, Bikaner district, Rajasthan (Figure 1 *b*).

The body fossil of arthropod is preserved in micaceous silty-sandstone bed. The specimen is 2 cm long and 1.4 cm

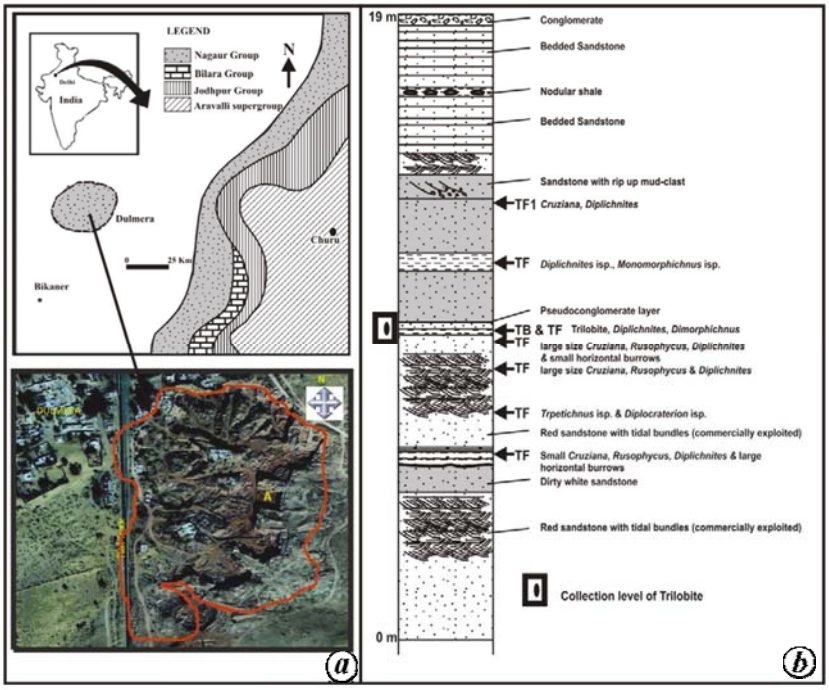

Figure 1. ***a***, Location map and satellite image of the Dulmera quarry (Bikaner district). ***b***, Litho-column showing horizons of the Nagaur Sandstone Formation (Marwar Supergroup) carrying trace fossils and 'trilobite' or 'articulated arthropod' as exposed in the Dulmera Quarry in Bikaner district.

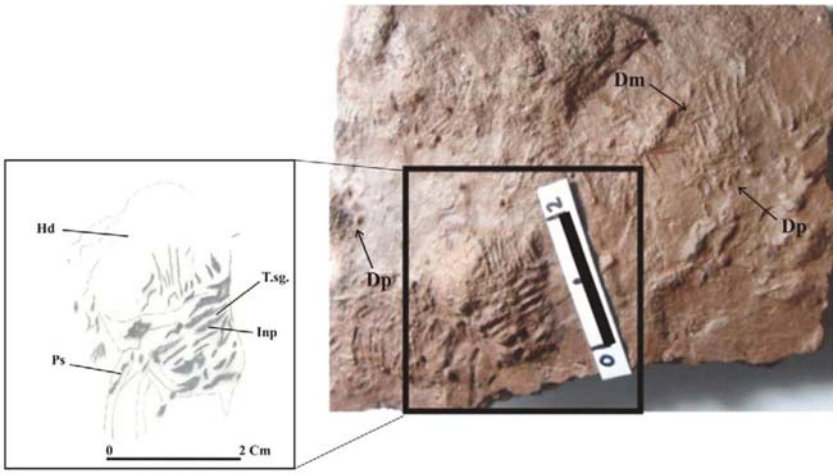

Figure 2. Reddish-brown micaceous silty-sandstone slab preserving Early Cambrian 'trilobite' or 'articulated arthropod tergites' and *Diplichnites* (Dp) and *Dimorphichnus* (Dm) traces of *Cruziana* ichnofacies in the Nagaur Sandstone Formation. Hd, Head; T.sg., Thoracic segments; Inp, Interpleural space; Ps, Pleural spines (scale bar = 2 cm).

wide, with eroded and poorly preserved cephalon, six to seven thoracic segments with three lateral pleural spines (Figure 2). Two of the lateral pleural spines are large and the third posterior one is comparatively smaller in size. The cephalon is poorly preserved. As a result, the glabella is not clearly visible. The interpleural region and pleural segments of the thorax are clearly visible. The appendage marks are preserved over the head portion of the trilobite. Provisionally, the specimen can be referred to a redlichid trilobite. However, the possibility of it being an 'articulated arthropod tergites' cannot be ruled out (Nigel Hughes, pers. commun., 2012). Efforts are underway to collect more and better preserved specimens to enable final identification and detailed taxonomic description.

The poor preservation of the body fossils in Nagaur Sandstone Formation is attributed to shallow-marine clastic environment, where dissolution and physical reworking processes are common. The silty-sandstone horizon is followed by a conglomeratic layer enclosing flat grit that consists of pebbles and fine mud clasts. On the same slab, traces of *Diplichnites* and *Dimorphichnus* are also preserved. The association of *Diplichnites* and *Dimorphichnus* with suspected 'articulated arthropod tergites' is suggestive that such traces can be produced by arthropods other than trilobites[13]. Besides these, assemblage of trace fossils comprising *Cruziana cantabarica*, *Rusophycus avolensis*, *Rusophycus bommerensis*, *Diplichnites* isp., *Monomorphichnus* isp., leap-frog marks of arthropods, *Bergaueria* and *Treptichnus* isp., have also been collected from the six stratigraphic levels lying between 4 and 11 m above the base of the quarry.

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