



TRACE FOSSILS FROM THE JURASSIC SEQUENCE OF JAISALMER BASIN, RAJASTHAN

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ABSTRACT

The present paper deals with trace fossils reported for the first time from the Kolar Dongar Member of the Bhadasar Formation of Tithonian age (Upper Jurassic) in the Jaisalmer sedimentary basin. These include the ichnogenera *Gyrochorte*, *Didymaulichnus* and *Planolites* in association with vertical, horizontal and inclined burrow-filled tubes in sandstone-clay intercalation.

Key words : Trace fossils. Jaisalmer (Rajasthan), Jurassic. Bhadasar Formation.

INTRODUCTION

Marine Jurassic sequence of Rajasthan is well known from the earliest geological investigations in the Jaisalmer area by Blanford (1877), Oldham (1886), La Touche (1911) and Sahni and Bhatnagar (1958).

Dasgupta (1975) has given a detailed lithostratigraphic classification of Jaisalmer basin including the facies variations (table 1).

The fossils of ammonites, foraminifera and ostracoda reported by different workers (e.g.

Lobimova *et al.* 1960; Subbotina *et al.* 1960. Singh and Krishna, 1969; Kachhara and Jodhawat. 1981; Kalia and Chowdhary, 1983 and Krishna, 1987) have resulted in the biostratigraphic zonation of Jurassic strata of the Jaisalmer Basin. Dave and Chatterjee (1996) discussed at large the marine transgression and regression phases during the Jurassic Period in the Jaisalmer area and provided an integrated foraminiferal and ammonoid biostratigraphy and its correlation with the Kutch.

The older sediments of Proterozoic age in the Jaisalmer area are succeeded by the continental

Table 1 : Jurassic Stratigraphy of the Jaisalmer area (modified after Dasgupta, 1975).

	Age	Formation	Member	Lithology/Facies	Section studied
J	Neocomian	Pariwar		Sandstone and shale alternation with plant fossils and fossilised tree trunk	
U	Tithonian	Bhadasar	Mokal Kolar Dongar	Coarse to fine-grained sandstone interbedded with shales and nodules bearing trace fossils	Bhadasar Scarp section (7m thick)
R	Kimmeridgian	Baisakhi	Rupsi Ludharva Baisakhi	Marine shale and sandstone alterations	
A	Unconformity				
S	Oxfordian to Callovian	Jaisalmer	Kuldhar Badabag Fort Joyan	Alterations of marine arenaceous limestone and calcareous sandstones.	
S	? Bathonian to Lias	Lathi	Thaiyat	Sandstones with plant fossils	
C	Unconformity				
	Proterozoic	Older sediments			

deposits of the Lathi Formation (Lias) which was followed by the marine Jurassic succession comprising the Jaisalmer, Baisakhi and Bhadasar Formations (Bathonian-Tithonian).

During the present investigations, trace fossils have been reported for the first time from the Kolar Dunger Member of the Bhadasar Formation of Jaisalmer area of Rajasthan (fig. 1). Their stratigraphic position is indicated with respect to foraminiferal and ammonite biozones (fig. 2).

In the Phanerozoic rock record, the trace fossils, unless correlated to a particular animal, have got a limited stratigraphic significance. The occurrence is controlled by ecology and the hydrodynamics of the depositional environment.

However, previously the ichnostratigraphy has been worked out from the Jurassic of Kutch by many workers (Badve and Ghare, 1978; Kumar *et al*, 1982 and Kulkarni and Ghare, 1989, 1991). The environmental interpretations based on ichnofaunal elements from the Jurassic of Kutch has been attempted by Howard and Singh (1985), Fürsich (1998) and Singh and Shukla (1991, 1998).

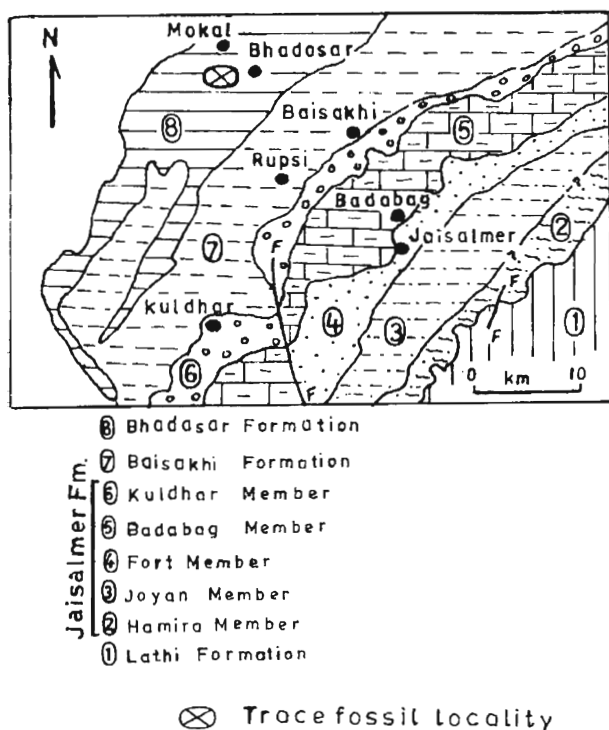


Fig. 1. Geological map of the Jaisalmer area of Rajasthan showing the trace fossil locality (modified after Dave and Chatterjee, 1996).

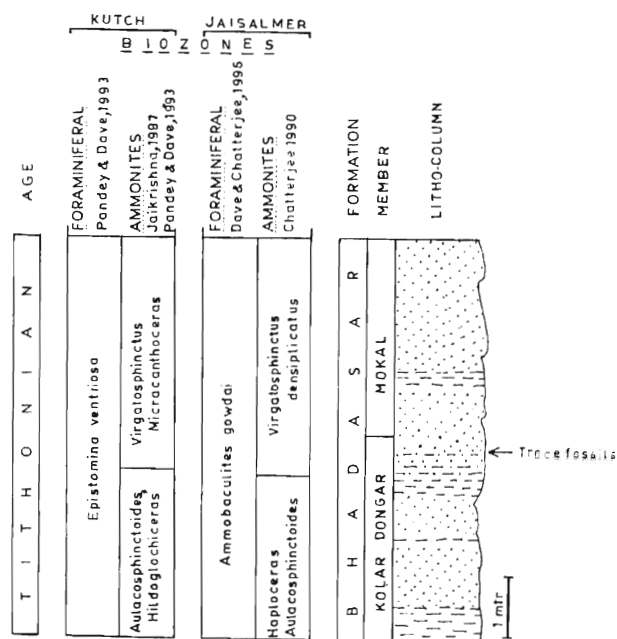


Fig. 2. Age, foraminiferal and ammonite biozones of Kutch and Jaisalmer and the lithocolumn indicating the stratigraphic position of trace fossils in the Bhadasar section of Jaisalmer, Rajasthan.

Repository

The trace fossil specimens bearing numbers from JUF 161 to 191 are kept in the Palaeontology Museum in the Post Graduate Department of Geology, University of Jammu, Jammu.

SYSTEMATIC DESCRIPTION

Ichnogenus *Gyrochorte* Heer, 1865
Gyrochorte comosa
 (Pl. I, figs. a-j; fig. 3c)

Material : Twelve specimens preserved in the yellowish brown sandy shale.

Remarks : Straight to gently curving traces, horizontal to the bedding plane, width generally ranging from 3 to 9 mm, preserved as plaited ridges with biserially arranged and obliquely aligned pads of sediments (3 to 9 mm) in epirelief and preserved as smooth biserially shallow grooves separated by median furrow, traces may cross over each other. Specimens show close similarity with *Gyrochorte comosa* in the pattern of biserially arranged ridges and grooves with obliquely aligned successive pads.

Gyrochorte is a grazing trace produced by a cylindrical animal moving across the sediment surface oblique to the bedding planes.

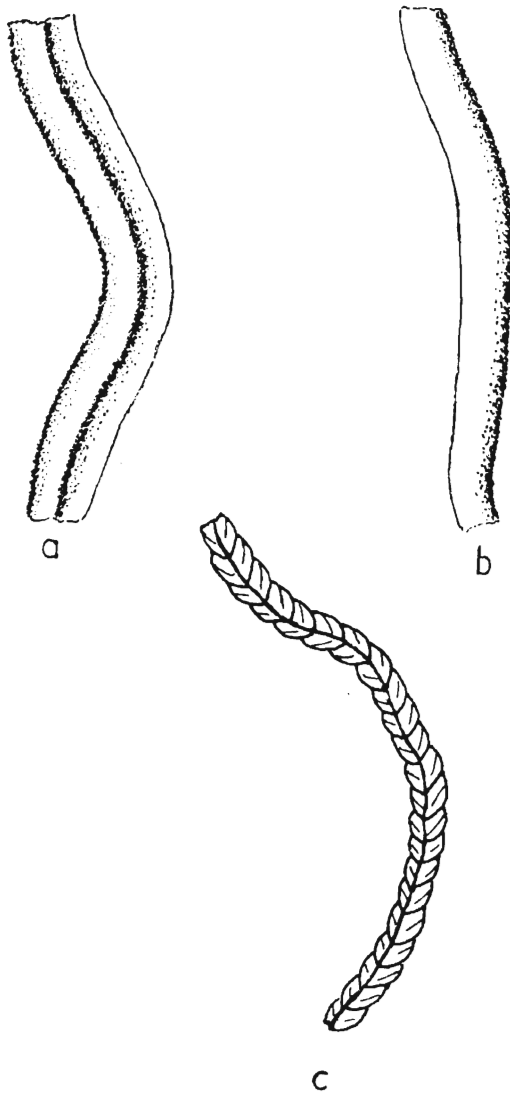


Fig. 3. Sketched diagrams of the described ichnofossil specimens. (a) *Didymaulichnus* sp. (b) *Planolites* sp. (c) *Gyrochorte comosa*.

Ichnogenus *Planolites* Nicholson, 1873

Planolites sp.

(Pl. I, fig. k ; fig. 3b)

Material : A single trace preserved in brown sandy shale.

Remarks : Straight to gently curved burrow-infilled tube, horizontal to the bedding plane, seen as convex relief, about 15 mm in diameter. The present specimen is attributed to the ichnogenus *Planolites*, the burrow-infilled tubes of cosmopolitan origin which are commonly found associated with

finer clastics as fodinichnial traces.

Ichnogenus *Didymaulichnus* Young, 1972

Didymaulichnus sp.

(Pl. I, fig. 1; fig. 3.a)

Material : A single trace preserved in brown sandy shale.

Remarks : Horizontal, gently curving, bilobate trace, 8 mm wide, lobes separated by shallow but distinct median furrow, surface of the trace smooth. Specimen resemble *Didymaulichnus* in bilobate nature of the trace with smooth surface and a well-defined median furrow.

Burrow-filled tubes

(Pl. II, figs. a-e)

Horizontal, vertical and inclined filled-burrows are commonly preserved as tubes in yellow brown muddy sandstone in the Bhadasar scarp section of Jaisalmer and at places found in association with ichnogenus *Gyrochorte*.

DISCUSSION

As it is evident from the earlier record, an integrated foraminiferal and ammonite biostratigraphy of Bathonian-Tithonian succession in the Jaisalmer Basin has been established (Chatterjee, 1990 and Dave and Chatterjee, 1996).

However, the present record of trace fossils occurring above the *Haploceras-Aulacosphinctoides* and below the *Virgatosphinctus denisplicatus* zone (Ammonite biozones) and the corresponding *Ammobaculites gowdai* zone (foraminiferal biozones) in the Bhadasar Formation of the Jaisalmer area is significant as it reflects the biogenic activities of the soft-bodied organisms which are generally not preserved in the rock record. Presence of such traces in the form of crawling-meandering (horizontal) and burrowing (vertical or nearly vertical) trails indicates an aerobic environment on the substratum with low energy conditions. *Gyrochorte* and *Planolites*-like traces are probably made by polychaete-like worms (Heinberg, 1973 and Hantzschel, 1975) during sediment feeding, whereas *Didymaulichnus* possibly represents crawling trails of molluscan origin (Glaessner, 1969). They exhibit shallow marine, low energy environment.

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EXPLANATION OF PLATES

Plate I

- (a) *Gyrochorte comosa*
- (b) *Gyrochorte comosa*
- (c) *Gyrochorte comosa*
- (d) *Gyrochorte comosa*
- (e) *Gyrochorte comosa*
- (f) *Gyrochorte comosa*
- (g) *Gyrochorte comosa*
- (i) *Gyrochorte comosa*
- (j) *Gyrochorte comosa*
- (k) *Planolites* sp.
- (l) *Didymaulichnus* sp.

Plate II

- (a) to (c) Vertical, inclined and horizontal burrow-filled tubes of various sizes and shapes.



a



b



c



d



e



f



g



h



i



j



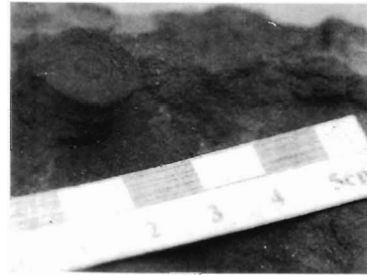
k



l



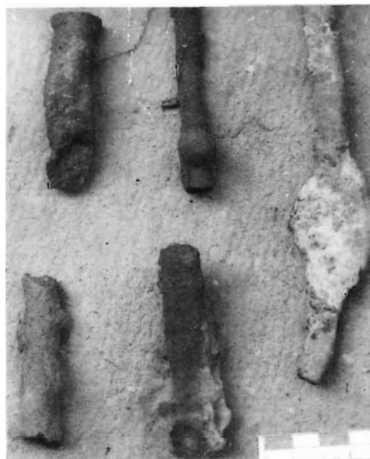
a



c



d



b



e