



SHORT COMMUNICATION

# RECORD OF *ADVENASTER* HESS, 1955 (ASTEROIDEA) FROM THE BATHONIAN PATCHAM FORMATION OF KALA JHAR IN HABO DOME, KACHCHH BASIN, INDIA

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## ABSTRACT

The asteroid genus *Advenaster* Hess, 1955 is being recorded and described for the first time from the Indian subcontinent. The specimen has been collected from limestone beds of the Middle Jurassic (Bathonian) Patcham Formation exposed in a deep gorge in the centre of the Habo Dome, south of the village Dhrang, Kachchh, India.

**Keywords:** Asteroidea, *Advenaster*, Patcham Formation, Middle Jurassic (Bathonian), Kachchh, India

## INTRODUCTION

The Fossil asteroids (Echinodermata) of the Indian subcontinent are less known in comparison to other fossil groups. Although many of the surviving lineages of starfishes appeared during an early Mesozoic radiation of this class and have undergone limited change since then, they left a very poor fossil record (Blake, 1981) and until now only two genera, namely *Indiaster* Rao from Jurassic sediments of Kachchh (Rao, 1957) and *Asterias* Linné, 1758 (Naryana Rao and Seshachar, 1927) from the Cretaceous rocks of South India are known. The record of the asteroid genus *Advenaster* Hess, 1955 from the Jurassic of Kachchh is made more significant by the fact that it is apparently the first report from India. The specimen has been collected by Mr. M. Alberti during field-work jointly carried out with Drs. F. T. Fürsich and D. K. Pandey. The laboratory studies have been carried out by the first author (DKS).

The Kachchh Basin on the western margin of the Indian plate (Fig. 1) is known for its rich and well-preserved Jurassic invertebrate fauna since 1840, when Grant and Sowerby gave general descriptions of the geology and of some fossils. It is an E-W oriented rift basin with a Jurassic and early Cretaceous sedimentary fill. Lithostratigraphically, the Jurassic sedimentary successions have been grouped into ten formations (Fig. 2) ranging in age from pre-Bajocian to Tithonian. The lithology of the section from where the specimen has been collected [basal limestone beds of the Middle Jurassic (Bathonian), Patcham Formation], exposed in a deep gorge [Kala Jhar (23°22'59" N : 69°30'49" E)] in the centre of the Habo Dome, south of the village Dhrang, is given in Fig. 3. The limestone beds have been assigned a Bathonian age on the basis of foraminifers (Bhalla and Abbas, 1984).

The Jurassic invertebrate fauna recorded from the Kachchh Basin consists of bivalves (Kitchin, 1903; Cox, 1940, 1952; Jaitly *et al.*, 1995; Fürsich *et al.*, 2000; Pandey *et al.*, 1996), ammonites (e.g., Waagen, 1873-1875; Spath, 1924, 1927-1933; Jaitly and Singh 1983; Krishna 1984; Krishna and Ojha, 1996; Krishna and Westermann, 1987; Pandey and Callomon, 1995; Jain *et al.*, 1996), corals (Gregory, 1900; Beauvais, 1978;

Pandey and Fürsich, 1993), gastropods (Jaitly *et al.*, 2000; Jaitly and Szabo, 2002, 2007), sponges (Mehl and Fürsich, 1997), brachiopods (Kitchin, 1900), belemnites, echinoids (Gregory, 1893) and crinoids, etc. in order of decreasing abundance.

These basal limestone beds of the Habo Dome are dark coloured, well-bedded limestone-marl alternations up to 15 m thick. The limestone beds are 10-80 cm thick, laminated to hummocky cross-bedded, occasionally amalgamated grainstones with erosional bases. The marly interbeds are 10-20 cm thick. The dark colour is due to a sill that has intruded the beds. The boundary to the overlying Chari Formation is sharp, the latter starting with argillaceous silt with occasional sharp-based, laminated grainstone intercalations. The limestone beds have been interpreted as deposited in a fully marine environment above storm wave-base (Fürsich *et al.*, 2001).

## SYSTEMATIC PALAEOLOGY

(Spencer and Wright, 1966)

*Subphylum* Asterozoa Zittel, 1895

*Class* Stelloidea Lamarck, 1816

*Subclass* Asteroidea de Blainville, 1830

*Order* Paxillosida Perrier, 1884

*Suborder* Diplozonina Spencer & Wright, 1966

*Family* Asteropectinidae Gray, 1840

*Subfamily* Asteropectininae Gray, 1840

*Genus* *Advenaster* Hess, 1955

*Advenaster* sp.

(Plate 1, figs. 1-4)

*Material:* A single, moderately preserved specimen (RUC 2008II 1).

*Description:* Five armed star fish with moderately large disc; arms long, tapering with interbrachial arcs rounded. Three arms preserved almost up to the tips. Marginals of series consisting of large, blocky ossicles, inferomarginals and superomarginals opposite and equal in number. Inferomarginals robust with long axis normal to arm margins, wider than high and abutting the adambulacral along a flat surface. On middle and distal parts of the arms, inferomarginals have flat, rectangular plates. Ambulacral plates elongated normal to ambulacral groove.



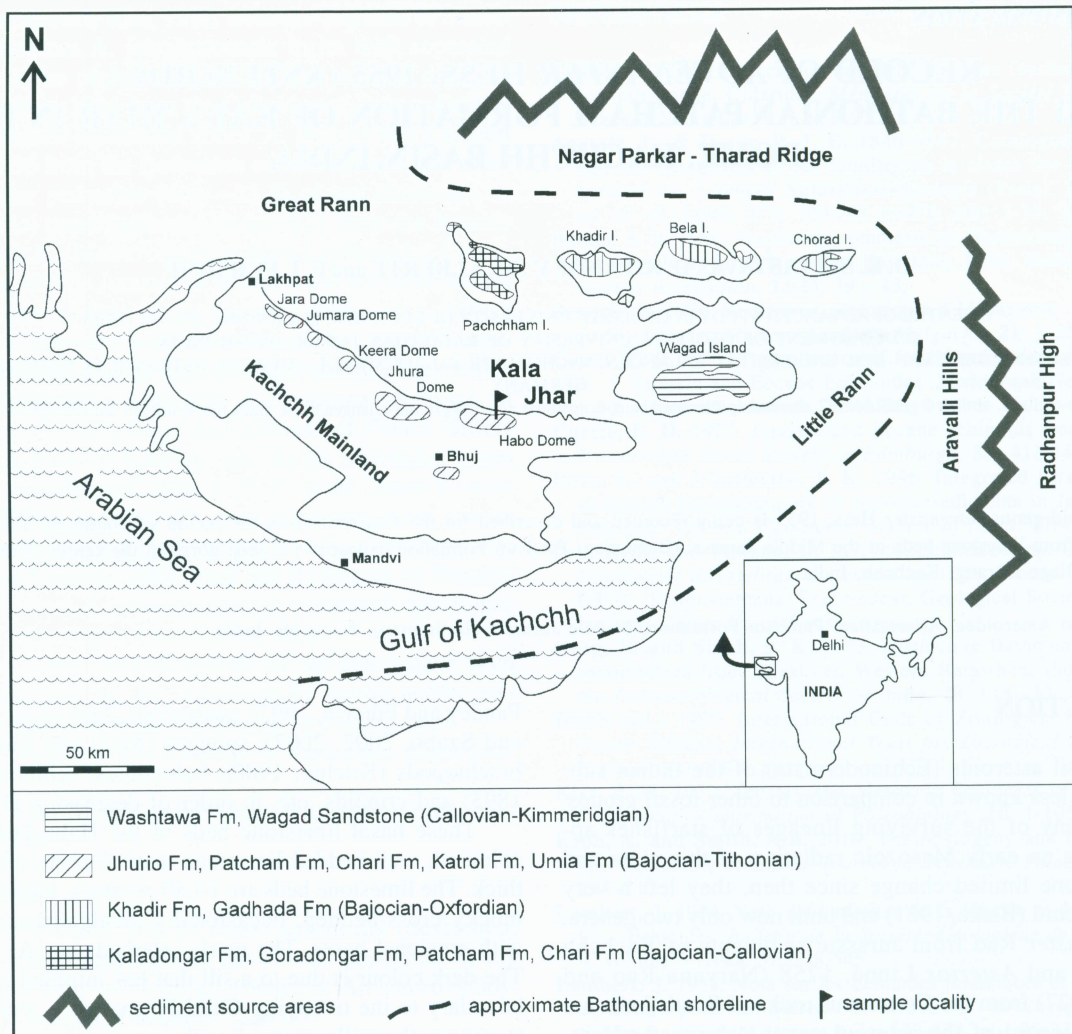


Fig. 1. Geological map of the area showing fossil locality.

**Remarks:** The new fossil has been identified only at the generic level, because of difficulties of comparing it with the differently preserved forms illustrated and discussed by Hess (1955, 1972). The specimen has been assigned to the Astropectinidae considering the overall body shape; the presence of large, paired marginals separated by well-developed fascioles; presence of large spines on the inferomarginals; inferomarginals that abut adambulacrals along a flat surface; adambulacrals that are robust with angular furrow edges (for separation of subsequent podia); the presence of ambulacrals with rectangular adradial outlines and large podial pores. All these features strongly suggest placement of this specimen under the genus *Advenaster* illustrated by Hess (1955).

**Locality:** Habo Dome, south of the village Dhrang, Kachchh, India

**Horizon:** Patcham Formation, Middle Jurassic (Bathonian).

## REPOSITORY

The described specimen has been deposited in the Museum, Department of Geology, University of Rajasthan, Jaipur-302004, India.

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## EXPLANATION OF PLATE I

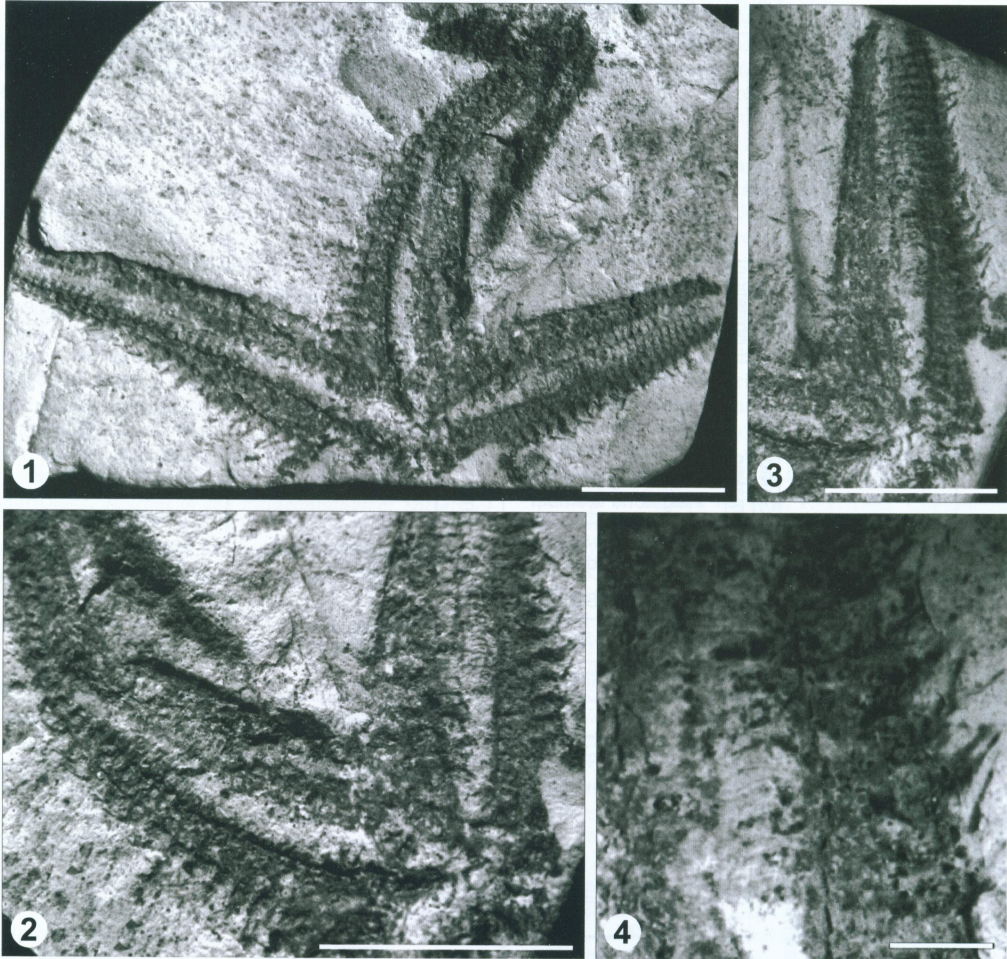
(Bar represent 10.0 mm otherwise as stated)

### 1-4. *Advenaster* sp. (Specimen No. RUC 2008II 1)

1. Actinal surface.
2. Actinal view of disc region.

3. Arm with inferomarginal spines.
4. Details of furrow, ossicles and spines (Bar represent 2.0 mm).





Time unit	Western Kachchh (Pachchham Is. & western part of Kachchh Mainland)		Eastern Kachchh	
			Khadir, Bela & Chorad Is.	Wagad
Tithonian to Early Cretaceous	Umia Formation	Umia Plant Bed, Pars? Umia Ammonite Bed		Wagad Sandstone Gamdau Fm
Kimmeridgian	Katrol Formation	upper Member middle Member lower Member		
Oxfordian	Chari Formation	Dhosa Oolite member	Gadhada Formation	Bambhanka/Gangta member
Callovian		Dhosa Sandstone mb		
		Gypsiferous Shale mb		
		Ridge Sandstone mb		
		Shelly Shale mb		
Bathonian	Patcham Formation	Raimalro Limestone Mb/Sponge Limestone mb	Patcham Formation	Raimalro Limestone Mb
Bajocian	Goradongar Fm	Purple Sst./Gadaputa Sst. Mb/Echinoderm packstone	Khadir Formation	Hadibhadang Sandstone mb  Hadibhadang Shale mb  Cheriya Bet Conglomerate mb
		JCL Goradongar Yellow Flagstone Member		
Early to Middle Jurassic	Kaladongar Fm	Leptosphinctes-bearing Pebbly Rudstone		
		Babia Cliff Sst. Mb		
		Kaladongar Sst. Mb		
Precambrian		Dingy Hill Mb	Basement rocks	

Fig. 2. Lithostratigraphy of the Jurassic rocks of the Kachchh Basin (modified after Rajnath, 1932; Biswas, 1980; Fürsich *et al.*, 2001; Krishna *et al.*, 2009); Sst - Sandstone, JCL - Jumara Coral Limestone, Fm - Formation, Mb or mb - Member.

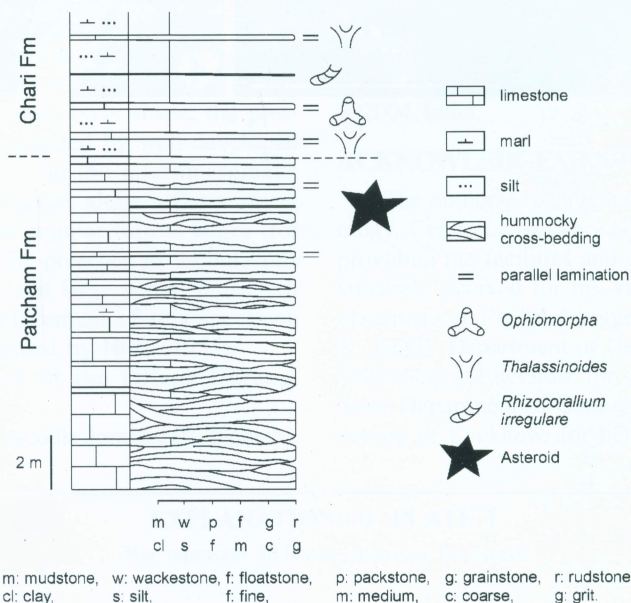


Fig. 3. Basal limestone beds (Patcham Formation, Middle to Upper Bathonian) showing occurrence of fossil asteroid.



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