



A NEW RECORD OF A SCHIZASTERID (ECHINODEA) FROM THE KHUIALA FORMATION, JAISALMER DISTRICT, RAJASTHAN, INDIA

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ABSTRACT

The schizasterid echinoid genus *Hypselaster* Clark, 1917 is recorded, for the first time, from the sediments of the Khuiala Formation (early Eocene) exposed near Sanu, Jaisalmer district, Rajasthan, India. The specimens are placed in a new species characterised by its large, oval test with weak frontal sinus; posteriorly eccentric ethmolytic apical system with two gonopores; anteriorly eccentric kidney-shaped peristome; long, petaloid anterior petals and very short posterior petals; longitudinally oval periproct at the posterior truncation and perforate, crenulated tubercles.

Keywords: *Hypselaster*, Khuiala Formation (early Eocene), Jaisalmer, Rajasthan, India

INTRODUCTION

The note records fossil schizasterid echinoid genus *Hypselaster* Clark, 1917 (Fischer, 1966 and Smith, 2009) from the basal sediments of the Khuiala Formation (early Eocene) exposed at about 600m northwest of village Sanu, Jaisalmer district, Rajasthan, India (fig. 1). Earlier, the echinoid genera recorded from Rajasthan are *Recrosalenia* [*R. jaisalmerensis* from the Jurassic sediments (Sahni, 1955; Sahni and Bhatnagar, 1958, Bhatia 1980)]; *Echinocyamus* [*E. jaisalmerensis* from the middle Eocene sediments (Srivastava and Mathur, 1996)], *Eupatagus* [*E. rajasthanensis* from the sediments of the early Eocene (Srivastava and Singh, 2008) and *Megapneustes* [*M. jaisalmerensis* from the sediments of early Eocene (Srivastava *et al.*, 2008)].

GEOLOGY OF THE AREA

The isolated outcrops of the fossiliferous Mesozoic and the Cenozoic formations in the Jaisalmer Basin are interspersed in the southeastern part of the basin within the desert sands

Table 1: Stratigraphic succession of the Tertiary sediments in the Jaisalmer area, Rajasthan, India.

Age	Formation	Member (surface)	Member (subsurface)
Pleistocene to Sub Recent	Shumar		
Middle Eocene	Bandah	Bakhri Tibba Batrewala Limestone	Bakhri Tibba Batrewala Limestone
Early Eocene	Khuiala	Khinsar Tetakkar Limestone	Upper Khinsar Sirhera Lower Khinsar Tetakkar Limestone
Palaeocene	Sanu	Mohammaed Dhani	Kharatar Mohammaed Dhani
Cretaceous	Abur/Pariwar		

(Singh, 2006). The Tertiary sequence in the Jaisalmer Basin (Das Gupta, 1974; Pareek, 1984; Singh, 1996; Singh, 2003; Sinha *et al.*, 1998; Bhandari, 1999 and Singh, 2007) is represented by the Sanu, Khuiala, Bandha and Shumar formations in ascending order. The stratigraphic succession met in the area is given in Table 1.

The age of echinoid-bearing horizon of the Khuiala Formation (calcareous sandy marl) is constrained by the presence of index larger foraminifer *Assilina lacunata* Cizancourt (Srivastava *et al.*, 2008) which indicates an early Eocene (Ypresian) age. The ostracode, bivalve and other biotic elements previously described from the Khuiala Formation (Khosla, 1972; Das Gupta, 1974; Pareek, 1984; Ghosh, 1987; Bhandari, 1995; Singh, 1996; Singh, 1997 and Singh, 2003) are also consistent with this age assignment.

SYSTEMATIC PALAEOLOGY

(Fischer, 1966)

Order Spatangoida Claus, 1876

Suborder Hemiassterina Fischer, 1966

Family Schizasteridae Lambert, 1905

Genus *Hypselaster* Clark, 1917

Hypselaster rajasthanensis n. sp.

(Pl. I, figs. 1-8)

Material: Two specimens (Holotype - GSI Type No. 21442 and Paratype - GSI Type No. 21443); preservation good.

Derivation of name: The species was named for the state Rajasthan, India.

Diagnosis: Test large, oval with mild frontal sinus; posteriorly eccentric ethmolytic apical system with two gonopores; anteriorly eccentric kidney-shaped peristome; petals sunken and do not reach the ambitus; II & IV long, petaloid and I & V very short; longitudinally oval periproct at the posterior truncation and imperforate, non crenulated tubercles.

Description: The specimens are characterized by a large oval test with weak frontal sinus and well rounded tumid margin. The test is longer than wide and wider than high, truncated towards posterior side and moderately keeled. Apical system eccentric posteriorly, ethmolytic with two circular genital pores (G1 and G4). Ambulacral petals large, sunken, petaloid and do

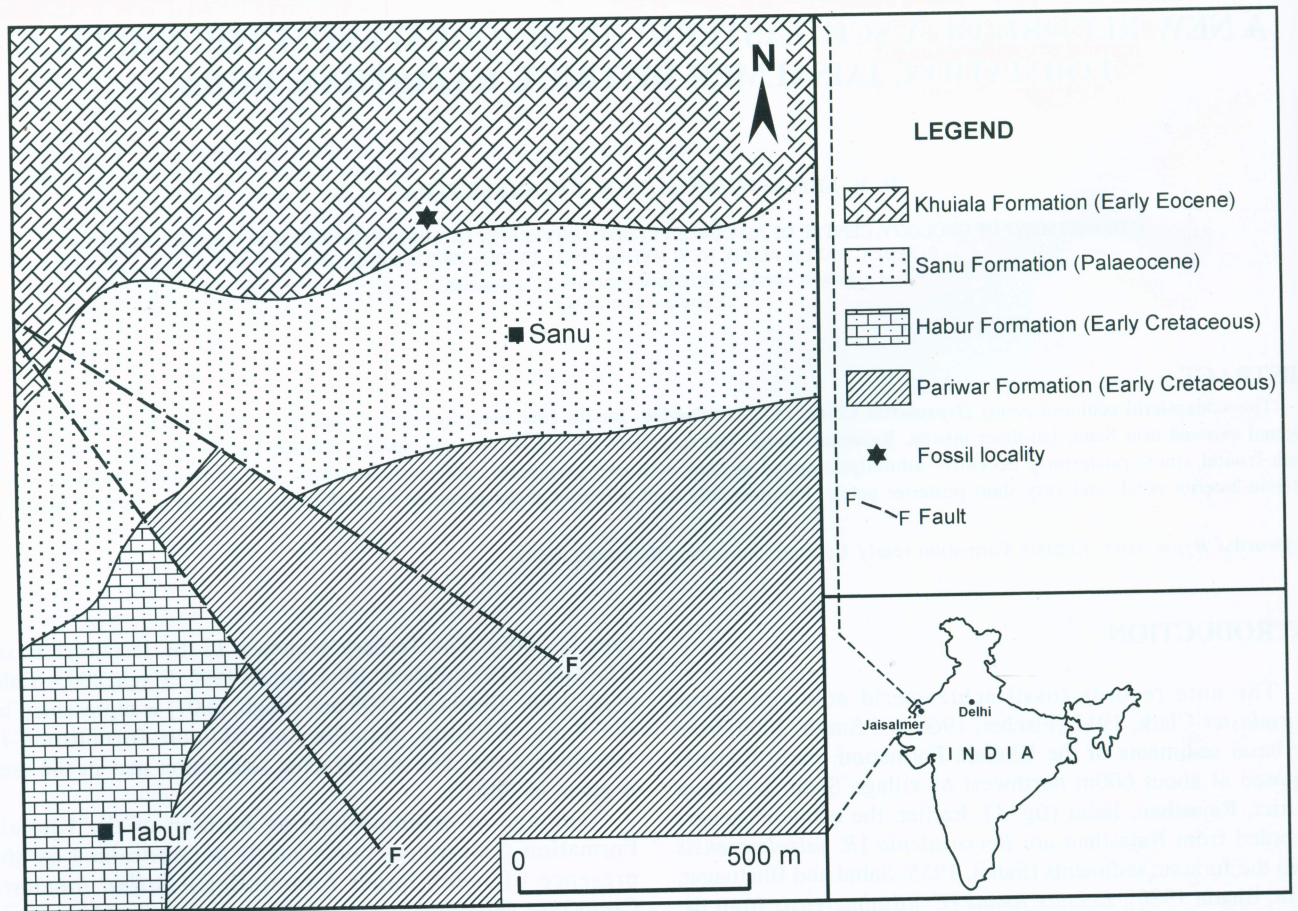


Fig. 1. Geological map of the area showing fossil locality (Srivastava and Singh, 2008).

not reach up to the ambitus; III longest, I & V shortest, II & IV slightly flexuous. Poriferous zones in depression, consisting of inner circular and oval to slit-like outer pores which are conjugated by a deep groove. Periproct longitudinally oval and lies on the vertical posterior truncation. Peristome kidney-shaped, excentric anteriorly. The peripetalous fasciole passes around the petals and do not indent in the interambulacral areas. The test is ornamented with perforate, crenulated tubercles which are sunken in small scrobicules. These are large, scarce and circumscribed by the peripetalous fasciole on the aboral side while orally these are dense and small. No traces of a subanal fasciole could be found laterally. The area below the periproct, where traces of a subanal fasciole occur in extant *Hypselaster* is not preserved.

Dimensions (in mm):

Specimen No.	Length (L)	Breadth (B)	Height (H)	Ratio between L, B & H		
GSI Type No.21442 (Holotype)	62.9	59.8	38.1	1.0	0.95	0.61
GSI Type No.21443 (Paratype)	61.2	55.6	38.9	1.0	0.91	0.64

Remarks: The Rajasthan specimen can be compared with *Schizaster alveolatus* Duncan and Sladen, described from the Eocene sediments of Sind, Pakistan (Duncan and Sladen, 1882-1886). However, the detailed examination of the described specimen of Sind at the Geological Survey of India, Kolkata revealed that it has deep frontal sinus and the details of apical system are lost. Since, the Rajasthan specimen has mild frontal sinus, it could be close to the echinoid genus *Hypselaster* H. L. Clark, 1917. These specimens differ from the echinoid genus *Ditrimaster* Munier-Chalms, 1885 in not having sub-globular and small test.

Hypselaster rajasthanensis n. sp. is close to the *Hypselaster obliquatus* (Sowerby) reported from the Eocene sediments exposed near Babia Hill, Kachchh (Grant, 1840) but it differs from the latter in not having a central apical system and circular test. The described new species also differs from *H. perplexus* Arnold and Clark described from the Eocene sediments of Jamaica (Arnold and Clark, 1927) in having sunken petals not reaching the ambitus.

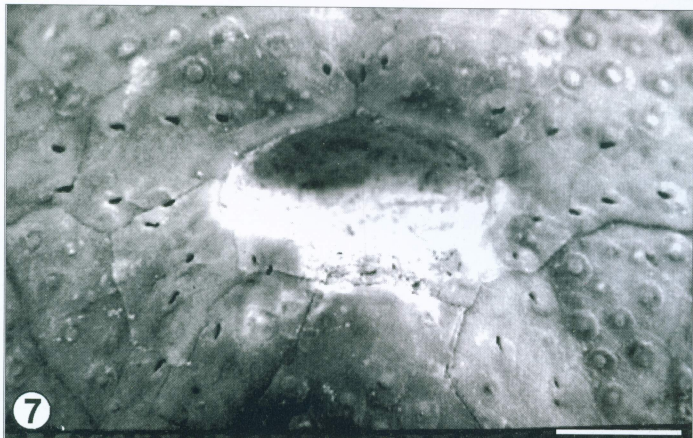
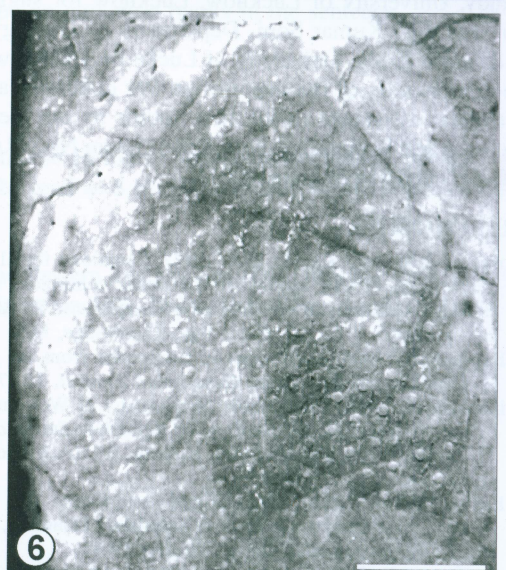
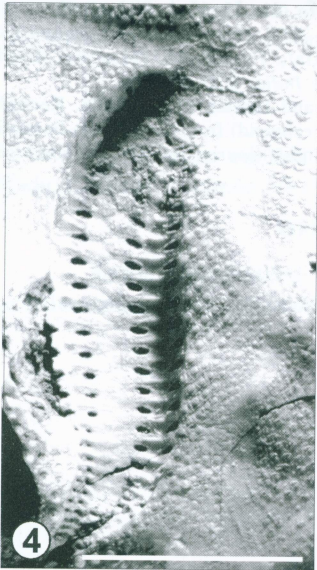
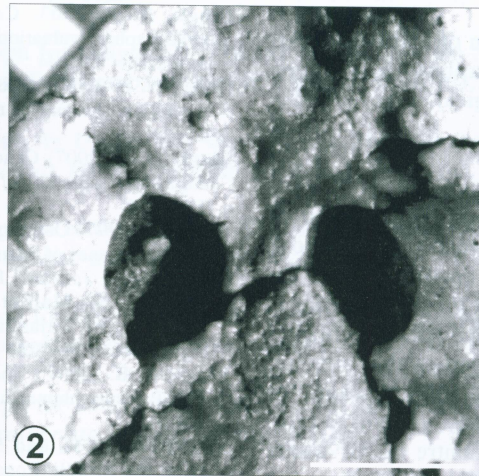
Type locality: About 600 m northwest of village Sanu,

EXPLANATION OF PLATE I

(Bar represents 5.0 mm otherwise as stated)

- 1-8. *Hypselaster rajasthanensis* n. sp. [GSI Type No.21442 (Holotype)]
1. Aboral view.
2. Apical disc (Bar represents 1.0 mm).
3. Oral view [GSI Type No.21443 (Paratype)].
4. Peripetalous fasciole.

5. Pore pairs in petal III.
6. Plastron [GSI Type No.21443 (Paratype)].
7. Peristome showing plate arrangement [GSI Type No.21443 (Paratype)].
8. Posterior view.



Jaisalmer district, Rajasthan, India.

Type horizon: Khuiala Formation (early Eocene).

REPOSITORY

All specimens of the present collection of fossil echinoids (described, undescribed and photographed) have been deposited in the Curatorial Division, Geological Survey of India, 27, J. L. Nehru Road, Kolkata-700 016.

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- Singh, N. P.** 1996. Mesozoic-Tertiary biostratigraphy and biogeochronological datum planes in Jaisalmer Basin, Rajasthan, p. 63-89. In: *Proceedings XVth Colloquium Indian Micropaleontology and Stratigraphy*, (Eds. Azami, et al., 1998) pp. 63-89.
- Singh, N. P.** 2003. Contribution of biostratigraphic studies in stratigraphic evaluation of west Rajasthan shelf. *Gondwana Geology Magazine*: 79-104.
- Singh, N. P.** 2006. Mesozoic lithostratigraphy of the Jaisalmer Basin, Rajasthan. *Journal of the Palaeontological Society of India*, **51**(2): 53-56.
- Singh, N. P.** (2007) Cenozoic lithostratigraphy of the Jaisalmer Basin, Rajasthan. *Journal of the Palaeontological Society of India*, **52**(2): 129-154.
- Singh, P.** 1997. Ostracodes from the subsurface Khuiala Formation (lower Eocene) of Manhera Tibba well-1, Jaisalmer, Rajasthan, India. *Geoscience Journal*, **18**: 149-233.
- Sinha Roy, S., Malhotra, G. and Mohanty, M.** 1998. Tertiary in 'Geology of Rajasthan'. *Journal Geological Society of India*, Bangalore: 219-228.
- Smith, A. B.** 2009. The Echinoid Directory [Electronic Publication]. [HTTP://www.nhm.ac.uk/palaeontology/echinoid](http://www.nhm.ac.uk/palaeontology/echinoid) (Accessed 19th May, 2009).
- Srivastava, D. K. and Mathur, U. B.** 1996. New fibulariid echinoid from the Middle Eocene rocks of Rajasthan, India. *Journal of the Palaeontological Society of India*, **41**: 53-56.
- Srivastava, D. K. and Singh H.** 2008. Brissid echinoid *Eupatagus* L. Agassiz, 1847 from the Khuiala Formation, Jaisalmer district, Rajasthan, India. *Earth science India*, **1**(2): 83-91.
- Srivastava, D. K., Rana, R. S. and Hukam Singh,** 2008. Record of *Megapneustes* Gauthier (Brissid echinoid) from the Khuiala Formation, Jaisalmer district, Rajasthan, India. *Journal of the Palaeontological Society of India*, **53**(1): 31-36.

REFERENCES

- Arnold, B.W. and Clark, H.L.** 1927. Jamaican fossil echini. With descriptions of new species of Cainozoic echinoidea by Herbert L. Hawkins - *Memoirs of the Museum of Comparative Zoology at Harvard College* **50**(1): 1-84, 22 pls., 3 figs., Cambridge, MA.
- Bhandari, A.** 1995. Early Eocene ostracodes from the subsurface of Jaisalmer Basin, Rajasthan. *Geoscience Journal*, **15**: 73-99.
- Bhandari, A.** 1999. Phanerozoic Stratigraphy of Western Rajasthan: A review, p. 126-174. In: *Geology of Rajasthan-Status of Perspective, Proceedings of a Seminar* (Ed. Kataria, P.), (A.B. Roy Felicitation volume).
- Bhatia, S. B.** 1980. Taxonomic comments on *Hemicidaris jaisalmerensis* from the Jurassic of Jaisalmer, Rajasthan, India. *Bulletin Indian Geologists Association*; **13** (1): 39-43.
- Das Gupta, S. K.** 1974. Stratigraphy of western Rajasthan Shelf. *Proceedings IVth Colloquium Indian Micropaleontology and Stratigraphy*, Dehradun, pp. 219-233.
- Duncan, P. M. and Sladen, W. P.** 1882-86. Fossil Echinoidea of Western Sind and the Coast of Baluchistan and of the Persian Gulf, from Tertiary formations. *Palaeontologia Indica*, **14**, 1(3): 87, Pl. 20, figs. 10-14 (GSI Type Nos. 2585, 2586).
- Fischer, A. G.** 1966. Spatangoids. pp. 543-U628 In: *Treatise on Invertebrate Paleontology* (Eds. Moore, R.C. et al.) pt U3 (2), (Echinodermata, Echinoidea), Geological Society of America Inc. and University of Kansas Press.
- Ghosh, C. C.** 1987. Report of serpulid framestone from Khuiala Formation (lower Eocene) Jaisalmer Basin, Rajasthan. *Current Science*; **56**: 414-415.
- Grant, C. W.** 1840. Memoir to illustrate a geological map of Kutch, geological papers on western India including Cutch, Sindh with an atlas of maps and plates. *Transactions Geological Society of London*; **5** (2): 289 - 326.
- Khosla, S. C.** 1972. Ostracodes from the Eocene beds of Rajasthan. *Micropaleontology*; **18**(4): 476-507.
- Pareek, H. S.** 1984. Pre-quaternary geology and mineral resource of northwestern Rajasthan. *Memoir Geological Survey of India*; **115**: 1-96.
- Sahni, M. R.** 1955. Recent researches in the Palaeontological Division, Geological Survey of India. *Current Science*; **25**(6): 187.
- Sahni, M. R. and Bhatnagar, N. C.** 1958. New fossils from the Jurassic rocks of Jaisalmer, Rajasthan. *Records Geological Survey of India*; **87**(2): 418-436.

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ERRATA

Bajpai, S., Kapur, V. V. and Thewissen, J. G. M. (2009). Creodont and condylarth from the Cambay Shale (early Eocene, ~55-54 Ma), Vastan Lignite Mine, Gujarat, western India. *Journal of the Palaeontological Society of India*, 54(1): 103-109.

1. Page 103, right column (paragraph for *Diagnosis*): The last sentence on the 5th line should start as follows:
...differs from *Tritemnodon* in having a single-rooted P/1...
2. Page 103, right column (paragraph for *Diagnosis*): The 16th line from top should read as follows:
...angled towards the protocristid notch...
3. Page 104, left column (3rd paragraph of *Description*): The 1st line should read as follows:
...The premolar size increases from P/1...
4. Page 106, right column (paragraph for *Description*): The 10th line should read as follows:
... A faint postmetacrista is present, better...
5. Page 106, right column (paragraph for *Description*): On the 15th line, there should be no quotation marks in the sentence
...The postprotocrista is weak in comparison,...
6. Page 108, left column, 3rd paragraph: On the 2nd line, there should be no quotation marks in the sentence
... referred to P4/ or M2/ of ...

In the paper entitled "Foraminifera and ostracods: signatures for middle Holocene palaeoenvironmental change, Muttu Kadu, Chennai" (volume 54(1), June 30, 2009, the name of the last author be read as S.M. Hussain instead of H. Mohammad.

In the paper entitled "Late Quaternary record of buliminids from the Eastern Arabian Sea (Off Goa) and its significance in Palaeoceanographic reconstruction" (Volume 54 (1), June 30, 2009, the figure on page 28 be read as Fig. 1 instead of Fig. 2.