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TAXONOMIC REVISION OF THE ECHINOID *HEMICIDARIS JAISALMERENSIS* SAHNI AND BHATNAGAR, 1955

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ABSTRACT

The hemicidarid *Hemicidaris jaisalmerensis* Sahni and Bhatnagar (in Sahni 1955) recorded and described by Sahni and Bhatnagar (1958) from the Jurassic sediments of the Jaisalmer Formation, Jaisalmer, Rajasthan, India was later reassigned to the genus *Recrosalenia* by Bhatia (1980). However, the re-examination of the holotype and paratypes of Sahni and Bhatnagar in Sahni (1955) suggests its placement under acrosaleniid genus *Acrosalenia* L Agassiz, 1840 instead of *Recrosalenia* Currie, 1925. The taxa are here redesignated as *Acrosalenia jaisalmerensis* (Sahni and Bhatnagar in Sahni, 1955) and a redescription of the type material as well as the new specimens is given.

Keywords: *Hemicidaris, Acrosalenia*, Jaisalmer Formation, Jaisalmer, Rajasthan, India.

INTRODUCTION

The *Hemicidaris jaisalmerensis* was recorded and described by Sahni and Bhatnagar (1958) from the Jurassic sediments of the Jaisalmer Formation, Jaisalmer, Rajasthan, India. Despite the good preservation of their material, they omitted a number of morphological details important for the systematic placement of the new taxon (e.g. apical disc and ambulacral plates on oral side near the peristome). Later, Bhatia (1980) provided some of this missing data and placed this species under the genus *Recrosalenia* Currie, 1925 on the basis of the presence of (1) suranal plates, (2) insert oculars I & V and (3) diadematoid ambulacral plates (diads and triads) between the ambitus and the peristome in the specimens of his collection (Topotype 1). Apparently, however, Bhatia (1980) did not re-examine the type material of Sahni and Bhatnagar (in Sahni, 1955) but based his re-description solely on new topotype material. The current whereabouts of Bhatia (1980) specimens, unfortunately, is unknown and thus not available as on date for study.

Recently, the first author (DKS) had an opportunity to have a look on the fresh collection of the similar echinoid specimens received from Dr. S. K. Kulshreshtha for study (specimen Nos. SKK 01-02). They come from the argillaceous to arenaceous limestone sediments of the Fort Member [Bathonian (middle to upper)] of the Jaisalmer Formation exposed at about 200 m north of Jaisalmer (Fig. 1). Based on the morphological features of these echinoids, it is clear that they are conspecic with the material of Sahni and Bhatnagar (in Sahni, 1955), Sahni and Bhatnagar (1958) and Bhatia (1980). The age diagnostic foraminifera recorded in these sediments include *Pseudomarsonella reflecta*, *P. biangulata*, *P. bipartita*, *P. inflata*, *Riyadhella nana*, *R. rotundata*, *R. inflata*, *Epistomina coronata*, *E. regularis* along with ostracods *Lophocythere bradiana*, *L. scabra* and *Ektyphocythere parva* (Garg and Singh, 1983).

The re-examination of the type material of *Hemicidaris jaisalmerensis* Sahni and Bhatnagar (in Sahni, 1955) preserved at the Museum, Geological Survey of India, Kolkata (GSI Type No. 17634-17638) recorded and described by Sahni and Bhatnagar (1958) from the Callovian sediments of the Jaisalmer Formation, Jaisalmer, Rajasthan India exhibits the following characters: (a) test small, hemispherical, flattened orally and slightly arched aborally, (b) apical disc large, reaching about between 31 and 49 % of test diameter with oculars I and V broadly insert; genital plates large, three suranal plates, periproct slightly displaced posteriorly with angular margin, (c) ambulacra narrow, straight with larger, primary tubercles restricted to the oral and subambital part, pore pairs uniserial above and at ambitus; adorally poriferous zones slightly expanded to form weak phyllodes and pores arranged in distinct arcs of three; simple ambulacral plating adapically changes into acrosaleniid plating ambitally; primary tubercles large and imperforate, (d) interambulacral plates slightly wider than tall, dominated by a single, large perforate and crenulate primary tubercle each; areoles well separated adapically, but confluent at ambitus and oral side; interradial zone about as wide as primary tubercles, densely granulated and (e) peristome large, about 50 % test diameter; more or less flush; with deep buccal notches. The lantern and spines are not preserved. The above morphological features suggest its placement under acrosaleniid genus *Acrosalenia* L Agassiz, 1840 (Smith, 2009) instead of *Recrosalenia* Currie, 1925.

SYSTEMATIC PALAEONTOLOGY

(Fell and Pawson, 1966; Kroh and Smith, 2010)

Order **Salenioida** Delage & Hérouard, 1903

Family **Acrosaleniidae** Gregory, 1900

Genus ***Acrosalenia*** L. Agassiz, 1840

Acrosalenia jaisalmerensis (Sahni and Bhatnagar in Sahni, 1955)

(Pl. 1, figs. 1-6, Pl. 2, figs. 1-4; text fig. 2)

Hemicidaris jaisalmerensis Sahni and Bhatnagar Sahni, 1955. *Current Science*, **24**(6): 187.

Hemicidaris jaisalmerensis Sahni and Bhatnagar, 1958. *Rec. Geol. Surv. India*, **87**(2): 418 - 436.

Recrosalenia jaisalmerensis (Sahni and Bhatnagar) Bhatia, 1980. *Bull. Ind. Geol. Assoc.*, **13**(1): 39 - 43.

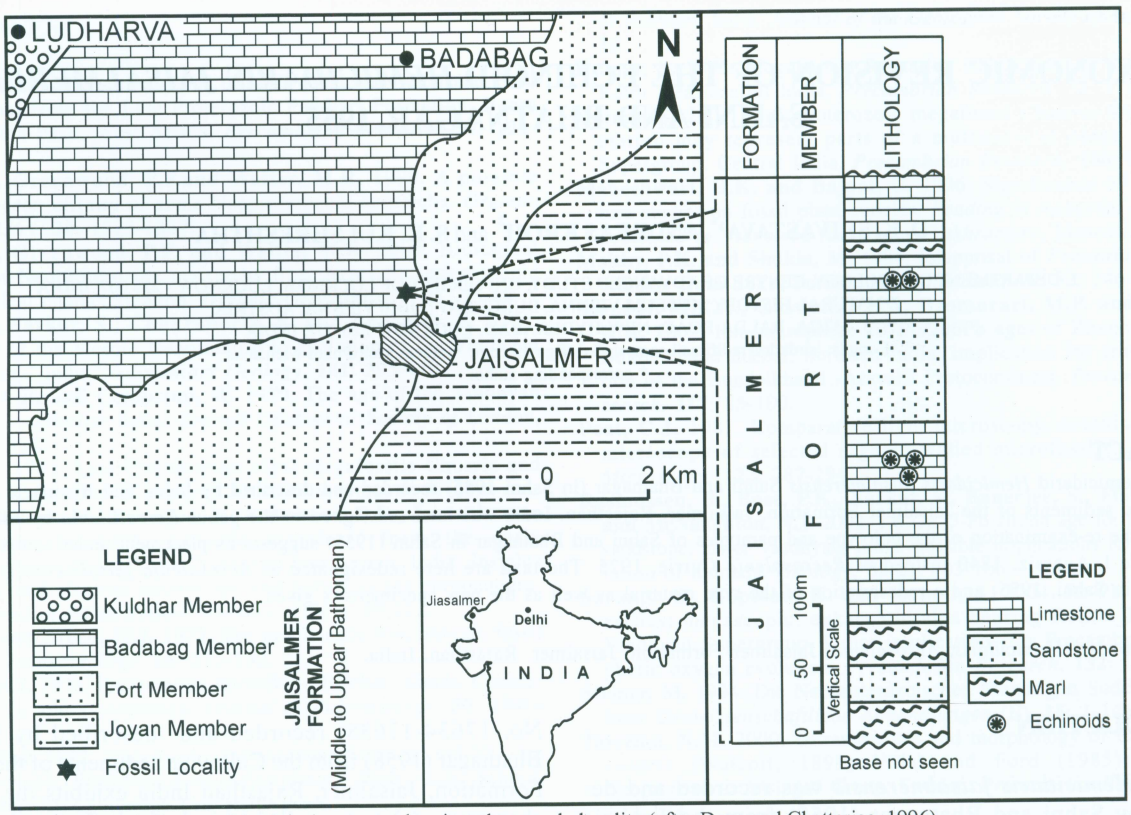


Fig. 1. Geological map of the Jaisalmer area showing the sample locality (after Dave and Chatterjee, 1996).

Material: seven specimens (Holotype - Geological Survey of India Type No. 17634; Paratypes - Geological Survey of India Type No. 17635-17638 [by designation of Sahni and Bhatnagar, 1958]; SKK 01-02 [S. K. Kulshreshtha]); preservation good.

Derivation of name: The species was named after Jaisalmer, Rajasthan, India.

Diagnosis: Small acrosaleniid echinoid with large hemicyclicl apical disc, oculars I and V broadly insert and three suranal plates. Enlarged ambulacral tubercles, primary tubercles restricted to the oral and subambital part of the ambulacra. High interambulacral plates. Interradial zones of the interambulacra moderately wide and granular. No naked zones adapically.

Description: Test small, hemispherical, with flattened oral side. Apical disc large, occupying about 36 % of test diameter; hemicyclic with oculars I and V broadly insert; genital plates large, hexagonal; three suranal plates present; periproct with angular margin, slightly displaced posteriorly. Ambulacra narrow, straight, with larger, primary tubercles restricted to the oral and subambital part; dense granulation between the two rows of primary tubercles; pore pairs uniserial above and at ambitus; adorally poriferous zones slightly expanded to form weak phyllodes and pores arranged in distinct arcs of three; simple ambulacral plating adapically changes into acrosaleniid plating ambitally; primary tubercles large and imperforate. Interambulacral plates only slightly wider than tall, bordering 6 to 7 ambulacral demiplates at the ambitus. Interambulacral plates dominated by a single, large perforate and crenulate primary tubercle each; areoles well separated adapically, but confluent at ambitus and oral side; interradial zone about as wide as primary tubercles, densely granulated. Peristome large, about 50 % of test diameter; more or less flush; with moderately deep buccal notches. Lantern and spines not preserved.

Remarks: This species has been attributed to Sahni and Bhatnagar (1958) by Bhatia (1980: p. 418) based on the erroneous assumption that *Hemicidaris jaisalmerensis* Sahni and Bhatnagar (in Sahni, 1955), p. 187 published in June 1955 represents a *nomen nudum*. In contrast to Bhatia (1980: p. 418) statement, this paper does include a description and does fulfil the necessary requirements of the ICZN (1999, 4th ed., Articles 11.9, 13.1) and is thus deemed as available here.

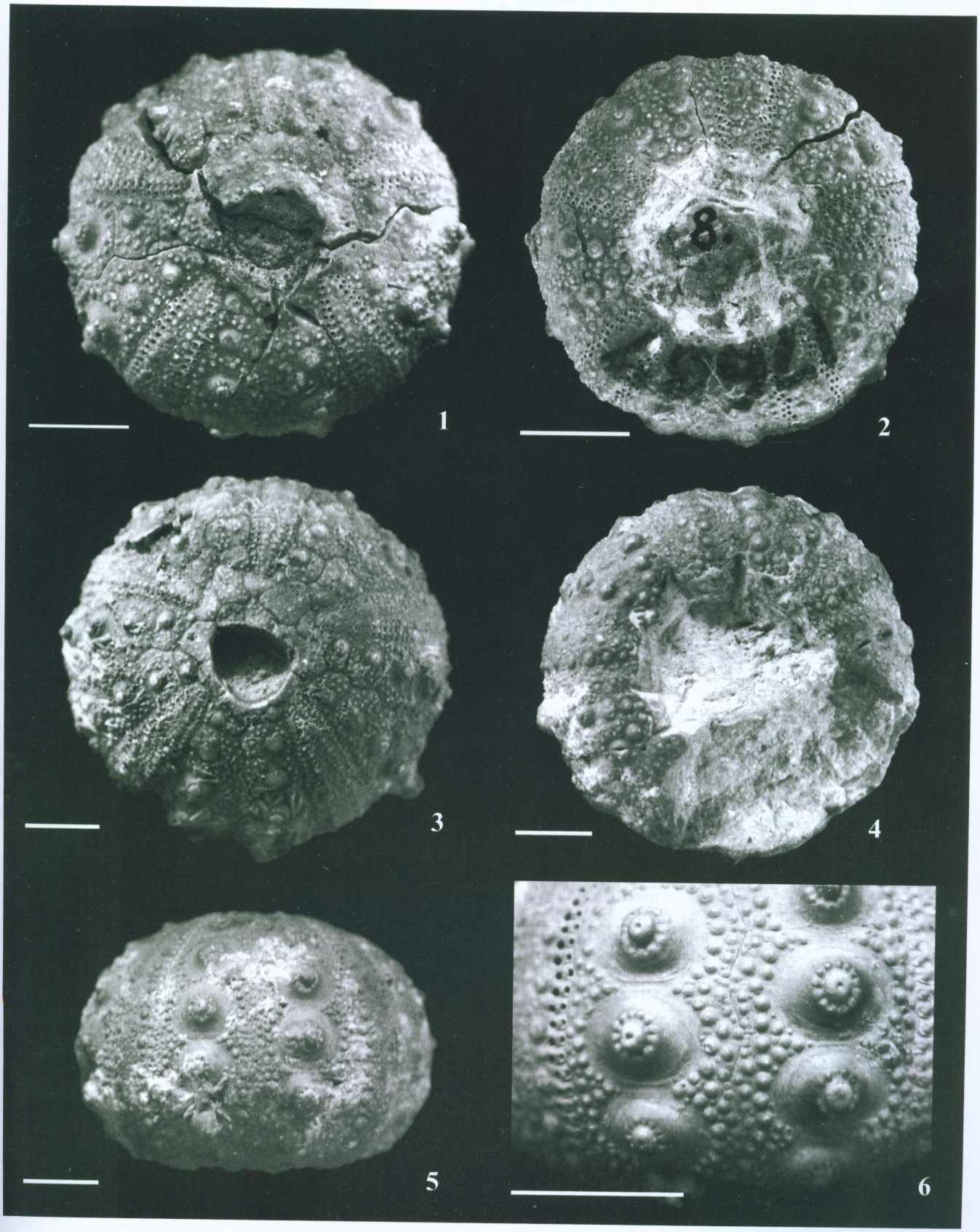
As outlined above, the original attribution to the genus *Hemicidaris* can be rejected because of the different apical disc, which is smaller (usually less than 25 % test diameter), dicyclic (rarely hemicyclic with a single ocular plate insert) and

EXPLANATION OF PLATE I

(Bar represents 5.0 mm)

1-6. ***Acrosalenia jaisalmerensis*** (Sahni and Bhatnagar in Sahni, 1955)
1. Aboral view. [GSI Type No. 17637 (Paratype)]
2. Oral view. [GSI Type No. 17637 (Paratype)]
3. Aboral view. [SKK 01]
4. Oral view. [SKK 02]
5. Lateral view. [SKK 02]
6. Ambital interambulacra, detail [GSI Type No. 17634 (Holotype)]

Plate I



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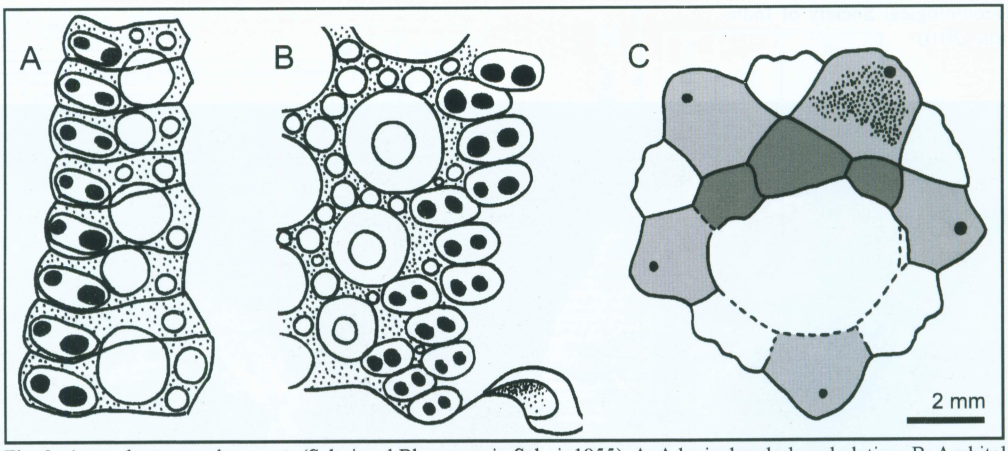


Fig. 2. *Acrosalenia jaisalmerensis* (Sahni and Bhatnagar in Sahni, 1955). A: Adapical ambulacral plating; B: Ambital ambulacral plating; C: Apical disc, ocular plates: white, genital plates: light grey, suranal/supplemental plate: dark grey. All drawings of GSI type no. 17637 (Paratype).

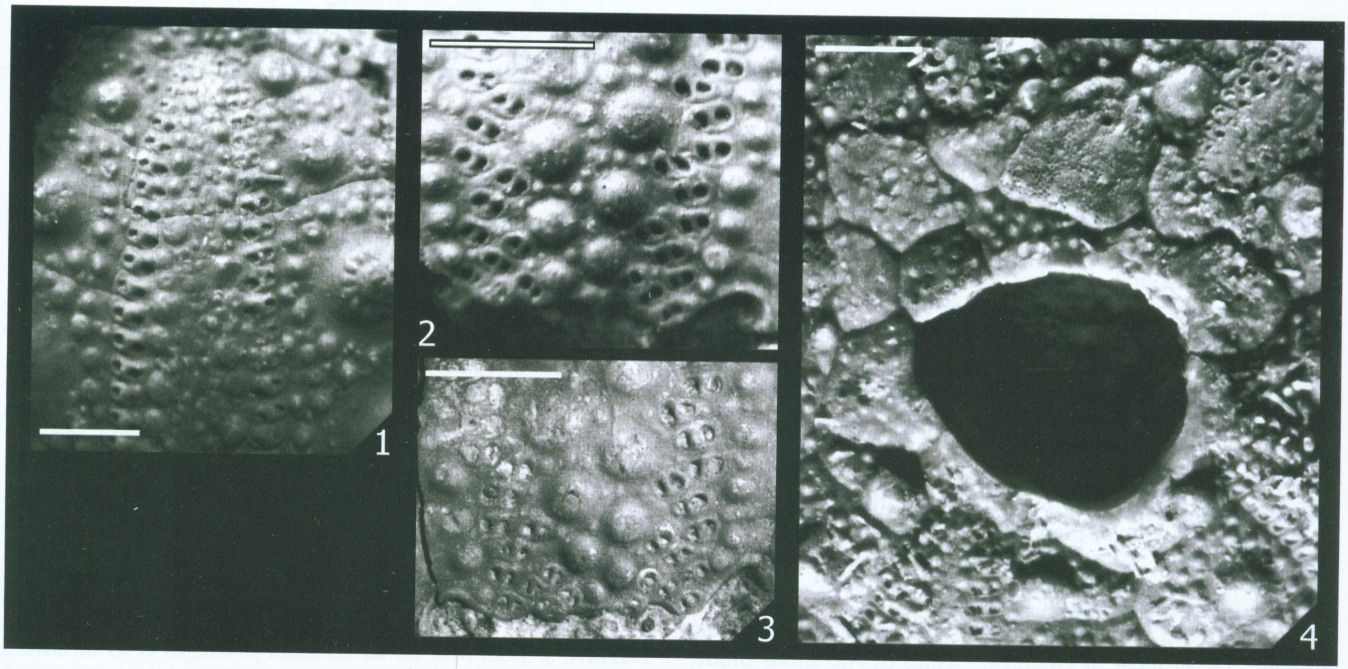
lacks suranal plates in *Hemicidaris*. The revised generic attribution of Bhatia (1980) to *Recrosalenia* likewise is unlikely, due to the differences in ambulacral (trigeminate throughout in *Recrosalenia*) and interambulacral plating (wide ambital interambulacral plates in *Recrosalenia*). According to Smith (2009) *Recrosalenia* is a junior synonym of *Monodiadema*. In this genus the apical disc is usually caduceus and far more posteriorly elongated than the present material. Additionally, the peristome is small in *Monodiadema* and large primary tubercles are largely missing in the oral and subambital ambulacra. The type material of *Hemicidaris jaisalmerensis* fit best with *Acrosalenia*. The subgenus *Acrosalenia* (*Milnia*), however, is characterized by its distinctly U-shaped genital plate 5 and thus can be ruled out.

COMPARISON WITH OTHER *ACROSALENIA* SPECIES

A. arabia Kier, 1972, from the Bathonian of Saudia Arabia, differs from *A. jaisalmerensis* by its higher number of interambulacral plates, which are comparatively low and border 3 to 5 ambulacral demiplates only at the ambitus. *A. bowersi* Kier, 1972, from the Bathonian of Saudia Arabia, differs from *A. jaisalmerensis* in its apical disc with 4 or more suranal plates, low interambulacral plates (bordering 3 to 4 ambulacral plates at ambitus), higher number of interambulacral plates per column and its smaller interambulacral primary tubercles adapically and at the ambitus. *A. chartroni* Lambert, 1904, from the Hettangian of France, differs from *A. jaisalmerensis* in its wide granular interradial zones, numerous plates per interambulacral column and larger ambulacral tubercles. *A. dhrumaensis* Kier, 1972, from the Bathonian of Saudia Arabia, differs from *A. jaisalmerensis* in its single, central suranal plate and lower interambulacral plates. *A. gananensis* Stefanini 1931 from the Jurassic of Somalia differs in its high test, much more posteriorly elongated apical disc and presence of naked interradial zones adapically.

A. hemicidaroides Wright, 1851, from the Bathonian of England, differs from *A. jaisalmerensis* in its larger ambulacral tubercles at the ambitus and above and its slightly undulating poriferous zones adapically. *A. lemoinei* Lambert in Lambert and Lemoine, 1908, from the Jurassic of Madagascar is distinguished by its single suranal plate, more elongate apical disc and high number of interambulacral plates per column. *A. loweana* Wright, 1857, form the Bathonian of England, differs from *A. jaisalmerensis* in its larger ambital interambulacral primary tubercles and low number of interambulacral plates per

Specimen no.	Diameter of the test (D)	Height of the test (H)	Diameter of the apical disc (A)	Relative width of apical disc (A/D)	Relative height of the test (H/D)
GSI Type No. 17634	28.52	21.22	-	-	0.74
GSI Type No. 17635	25.31	16.21	8.5	0.33	0.64
GSI Type No. 17636	22.63	11.52	-	-	0.50
GSI Type No. 17637	19.0	11.12	9.4	0.49	0.58
GSI Type No. 17638	27.64	19.41	8.8	0.31	0.70
SKK 01	29.52	16.7	10.3	0.34	0.56
SKK 02	29.6	20.2	10.6	0.35	0.68



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EXPLANATION OF PLATE II

(Bar represents 2.0 mm)

1-4. ***Acrosalenia Jaisalmerensis*** (Sahni and Bhatnagar in Sahni, 1955).
1. Adapical ambulacrum V [GSI Type No. 17637 (Paratype)].
2. Adoral ambulacrum IV [GSI Type No. 17637 (Paratype)].
3. Adoral ambulacrum II [GSI Type No. 17638 (Paratype)].
4. Apical disc [SKK 01].

column. *A. marratensis* Kier, 1972, from the Toarcian of Saudia Arabia, differs from A. jaisalmerensis in its well separated areoles and more posteriorly elongated apical disc. *A. mathildae* Lambert, 1935 from the Callovian of Poitou, France, differs in its narrow interradial zones. *A. microstoma* Lambert in Besairie, 1936 from the Bathonian of Madagascar differs by its much smaller peristome (only ~23 % of test diameter). *A. (Metacrosalenia) quadrimiliaris* Currie, 1927, from the Jurassic of Somalia and *A. (Metacrosalenia) pseudocidaroides* Currie, 1925, from the Middle Jurassic of Somalia and Ethiopia, differs from *A. jaisalmerensis* in its sinuous ambulacra, larger interambulacral tubercles with deep areoles that are well separated at the ambitus, and its high interambulacral plates which border 10+ demiplates ambitally. *A.? radians* (Agassiz, in Agassiz & Desor, 1847), form the Callovian of France, differs by its larger ambulacral tubercles and naked interradial zones adapically. *A. somaliensis* Currie, 1925, from the Lower Jurassic of Somalia, differs in its single, central suranal plate and its complete lack of enlarged interambulacral tubercles adapically.

A. spinosa Agassiz, 1840, from the Bathonian of Western Europe, differs from *A. jaisalmerensis* in its smooth apical disc and presence of a single suranal plate only.

Numerous other nominal species of the genus have been described in the past, but are insufficiently known and/or preserved for comparison with the species discussed here.

Locality: At about 200 m north of Jaisalmer, Rajasthan, India.

Horizon: Fort Member, Jaisalmer Formation [Bathonian (Middle to Upper)].

REPOSITORY

The present collection of fossil echinoids (described, undescribed and photographed) have been deposited in the Museum, Department of Geology, Centre of Advanced Study, University of Lucknow, Lucknow - 226 007.

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