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FOSSIL HOLOTHURIAN SCLERITE ASSEMBLAGE FROM THE CALLOVIAN-OXFORDIAN ROCKS OF JAISALMER, WESTERN RAJASTHAN, INDIA

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ABSTRACT

The present collection of holothurian sclerites represents an important assemblage with the first report of the genera *Rhabdotites, Stichopites, Cucumarites, Calclamnella, Eocaudina, Sastriella, Priscopedatus* and *Jumaraina* from Jaisalmer. The species *Rhabdotites* cf. *R. mortenseni* and *Stichopites mortenseni* represent the first report of these two genera from India. Three species of the genus *Cucumarites* including a new species *Cucumarites soodanii* identified in the present collection, have also been reported for the first time from the western Indian Jurassic sequence.

Key words: Holothurian sclerites, Callovian-Oxfordian, Systematic Description and Jaisalmer.

INTRODUCTION

A great volume of literature exists on the Jurassic mega and microfauna of Jaisalmer, but so far there is only a single published report regarding holothurian sclerites (Singh, Kulshreshtha, Garg and Saxena, 1981). The present assemblage shows close resemblance with the Jurassic assemblage of Kachchh reported by Soodan (1972a, 1972b, 1973a, 1973b, 1974, and 1977). The species present in both the assemblages are *Brianella acuta, B. giganta, B. pentaradiata, Achistrum monochordata, Jumaraina indica* and the genera *Sastriella* and *Eocaudina.*

This study documents 15 taxa of disassociated sclerites of holothuroidea belonging to 5 families, distributed among 10 genera. The total assemblage is dominated by the family *Priscopedatidae* (40%) followed by *Stichopitidae* (33.3%) *Calclamnidae* (13.3%), *Achistridae*(6.7%) and *Theeliidae* (6.7%) (fig 6). The genus *Brianella, Sastriella* and *Priscopedatus* represent the family Priscopedatidae dominant in the present collection.

On comparison with assemblage described by Singh *et al.* (1981) from the Callovian-Oxfordian rocks of the Kuldhar Member of the Jaisalmer Formation, the present holothurian forms are found to be quite different in composition, except for the common occurrence of the genera *Brianella* and *Eocaudina.* The present assemblage is lacking in the presence of the genera *Koteshwaria, Protocaudina, Theelia,* cf. *Elgerius* and the species *Frizzellus irregularis.*

The Jurassic holothurian sclerites were also reported from the Tethyan sediments exposed in the Malla Johar area of the Kumaon Himalaya (Uttaranchal). The genera *Theelia, Priscopedatus* and *Mortensenites* were found to be present in the Laptal Formation exposed in the Shalshal Gad near the Sumna-Laptal mule track (Saxena *et al.,* 1982). The present assemblage also contains the genus *Priscopedatus* but lacks *Theelia* and *Mortensenites* as reported by Saxena, Kumar, Singh and Singh (1982). But the genus *Theelia* has been reported earlier from the Callovian-Oxfordian of Jaisalmer (Singh *et al.,* 1981), though it is not found in the present material.

The present assemblage resembles taxa described from the Lias rocks of Heiningen and Jurassic rocks of Wuertemberg, Germany. The species occurring in both the regions are *Stichopites mortenseni* and *Rhabdotites* cf. *R. mortenseni.* These two genera have been reported for the first time from the Indian subcontinent. *Rhabdotites mortenseni* is also known to occur in the Jurassic rocks of Great Britain (Soodan and Whatley, 1987). The

assemblage from the Bathonian of Poland (Gorka and Luszezewskas, 1969) also resembles the present assemblage. The genera *Priscopedatus, Cucumarites* and *Achistrum* found in Poland are also identified in the present material. *Cucumarites* present in the Bathonian of Poland and the Triassic sequence of the Spiti Himalaya is also found to occur in the present assemblage. This is the first record of this genus from the Jurassic rocks of western India.

The species *Brianella acuta, B. giganta, B. pentaradiata* and *Jumaraina indica* are reported only from the Bathonian-Callovian sequence of the Jhurio Formation, Kachchh, India and *Achistrum monochordata,* already known from the Oxford Clay of Dorset and reported from the Upper Jurassic of Kachchh, has also been recovered in the present assemblage.

OCCURRENCE AND MATERIAL

These holothurian sclerites were collected from the stratigraphic sequence exposed around Pohra village (27°4'N - 70°54'E) of Jaisalmer, western Rajasthan, India in 1989 (fig. 1). The lithounits exposed at Pohra village consists mostly of hard and soft limestones alternating with soft ferruginous shale and marl beds (fig. 2).

Figs. 3 and 4 illustrate the percentage frequency and frequency of occurrence (based on minimum number of species) of the Callovian-Oxfordian holothurian sclerites at the Pohra section respectively.

The specimens described in this study are housed in the VPL *(Vertebrate Palaeontology Laboratory),* Centre of Advanced study in Geology, Panjab University, Chandigarh, India. Catalogued

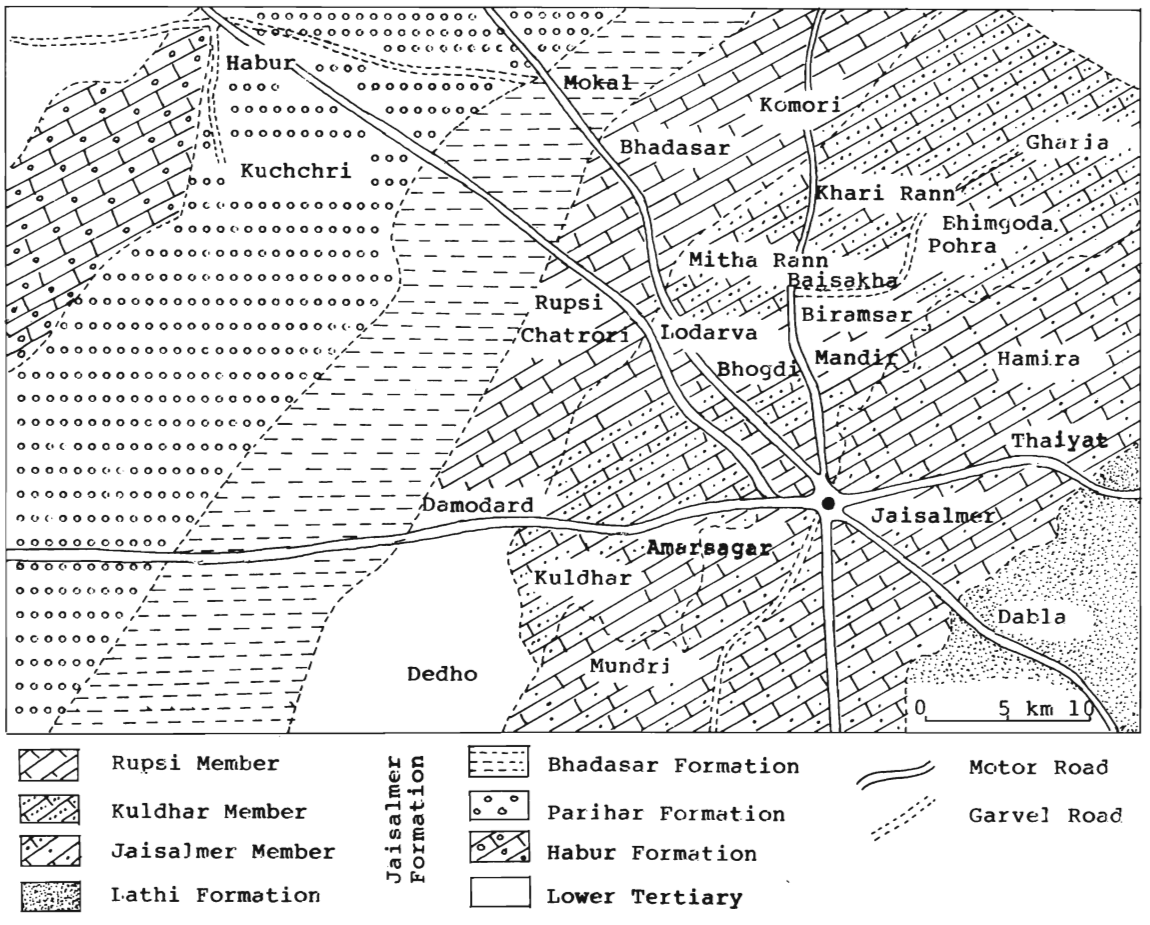


Fig. 1. Geological map of the Jaisalmer area, western Rajasthan, India.

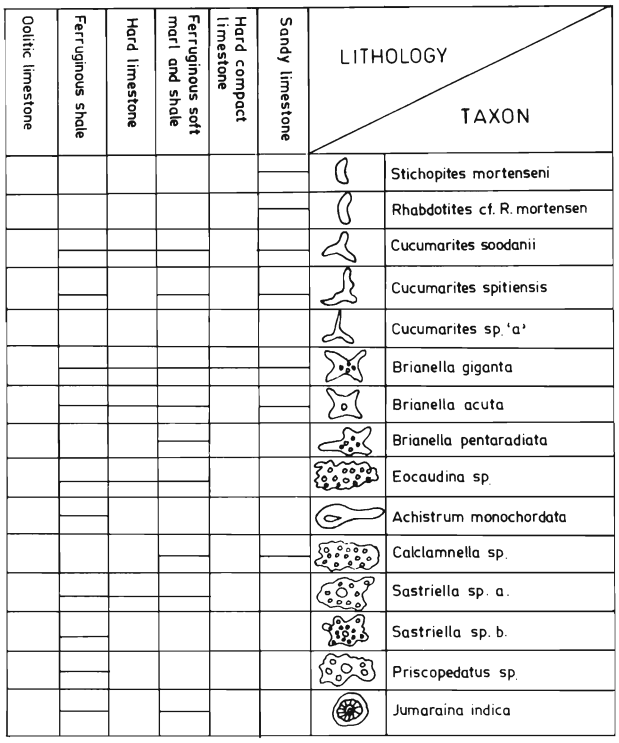


Fig. 2. Stratigraphic distribution of Callovian-Oxfordian holothurian sclerites at the Pohra Section.

specimens described here are listed as follows :

Name of the species	**Cat. No.**
Stichopites mortenseni	VPL-KD/12/3
Rhabdotites cf. *R. mortenseni*	VPL-KD/12/1,2
Cucumarites spitiensis	VPL-KD/1/53
Cucumarites soodanii	VPL-KD/1/54
Cucumarites sp. a	VPL-KD/1/55
Calclamnella sp.	VPL-KD/11/9
Eocaudina sp.	VPL-KD/1/65
Achistrum monochordata	VPL-KD/1/64
Brianella giganta	VPL-KD/1/60
Brianella acuta	VPL-KD/1/58
Brianella pentaradiata	VPL-KD/11/6
Sastriella sp. a	VPL-KD/6/55
Sastriella sp. b	VPL-KD/6/57
Priscopedatus sp.	VPL-KD/6/56
Jumaraina indica	VPL-KD/1/56, 57

SYSTEMATIC DESCRIPTION

Phylum **Echinodermata**

Class **Holothuroidea**

Family **Stichopitidae** Frizzell & Exline, 1956

Genus ***Stichopites*** Deflandre-Rigaud, 1953

Stichopites mortenseni Deflandre-Rigaud, 1952

(Pl. I, fig 1)

Stichopites mortenseni Deflandre-Rigaud, 1952, p. 953, text-fig. 13.

Description: Sclerite in the form of simple rod, bent slightly near the centre, circular in cross-section, tapering slightly from middle to round ends. Length varies from 0.74 - 0.76mm and diameter from 0.09 - 0.11mm.

Distribution and Remarks: Deflandre-Rigaud originally described the species *Stichopites mortenseni* from Jurassic (Lias) rocks of Heiningen, Germany in 1952. The present species under study compares well with *Stichopites mortenseni* in all aspects. This species has been reported for the first time from India.

Genus ***Rhabdotites*** Deflandre-Rigaud, 1953

Rhabdotites cf. *R. mortenseni* Deflandre-Rigaud, 1952

(Pl. I, fig. 2-3)

Rhabdotites mortenseni Deflandre-Rigaud, 1952, p. 955;

Description: Sclerite in the form of a rod, having small knob at each end, circular in cross section, diameter uniform throughout the rod, slightly arched, knobs subspherical, showing slightly greater diameter than that of rod, length between 1.02 - 1.25 mm, diameter at the middle 0.10 mm.

Distribution and Remarks: The species *Rhabdotites mortenseni* was originally described from the Jurassic rocks of Wuerttemberg, Germany by Deflandre-Rigaud (1953). The studied specimens can be compared with *Rhabdotites mortenseni,* but differ in having smaller sized knobs at the end of the rod. This is the first record of this species from India.

Genus ***Cucumarites*** Deflandre-Rigaud, 1952

Cucumarites spitiensis Soodan, 1986

(Pl. I, fig. 13)

Cucumarites spitiensis Soodan, 1986, p. 63, pl. 1, fig. 13.

Description: Sclerite triradiate; arms (one broken) solid, placed at equal angles to each other; long and nearly of uniform thickness all along the length, circular in cross section; central area small; angles between the arms 120°. Length of the two

SAMPLE No. → / SPECIES ↓	P_0		P_1		P_2		P_3		P_4		P_5		P_6		P_7		P_8		P_9		P_{10}		P_{11}	
	X	%	X	%	X	%	X	%	X	%	X	%	X	%	X	%	X	%	X	%	X	%	X	%
S. mortenseni																					2	15.4	9	27.3
R. cf. R. Mortenseni																					4	30.8	6	18.2
C. Soodanii					2	6.9	2	9.2	8	6.3	1	25	1	2.8	1	3.8								
Cucumarites sp.									17	21.8			10	27.8			4	11.1						
Cucumarites sp. a							2	12.3					6	16.7	4	15.4	2	5.5	2	40				
B. giganta					2	41.4	2	24.6	14	43.8	2	50	3	8.3	8	30.8	10	27.8	3	60	5	38.5	8	24.2
B. acuta					6	20.7	4	27.8	1.5	15.6	1	25	9	25	7	26.9	14	3.89			2	15.4	6	18.2
B. pentaradiata															1	3.8								
Eocudiana sp.									4	12.5					2	1.7	2	5.5						
A.Monochordata							3	4.6																
Calclanella sp.															2	1.7	4	11.1					4	12.1
Sastriela sp. a					4	13.8	2	3.1					2	5.5	1	3.8								
Sastriella sp. b							5	1.7																
riscopedatus							3	10.8																
Jumaraina indica					5	17.2							4	11.1										
Total					19		23		58		4		36		26		36		5		13		33	

X = number of specimens

Fig. 3. Percetnage frequency of the Callovian-Oxfordian holothurian sclerites at the Pohra section.

complete arms 0.22 mm, 0.15 mm.

Distribution and Remarks: Soodan (1986) originally described the species *Cucumarites spitiensis* from the Triassic sequence of the Spiti Himalaya, India. The present species is comparable to *Cucumarites spitiensis* in having equal angles (120°) between the arms, but differs in having two different lengths of the arms and almost uniform thickness all along the length of the arms. This species has been reported for the first time from the Jurassic rocks of western India.

Cucumarites soodanii n. sp.

(Pl. I, fig. 7)

Holotype: VPL - KD/1/54.

Diagnosis: Sclerite tri-radiate; arms solid, at unequal angles with respect of each other; uniform in tickenss; central area small.

Etymolotgy: This species is named after Dr. K. S. Soodan, a retired scientist of Oil and Natural Gas Corportation Ltd., in recognition of his contribution to Indian Palaeontology.

Description: Sclerite tri-radiate, arms solid, placed at unequal angles with respect to each other, uniform in thickness, distal end bluntly pointed, circular in cross-section; central area small. Length of the arms 0.22 mm, 0.085 mm, 0.095 mm and angle between arms 123°, 117°, and 120°.

Discussion: This species differs from all other known species of the genus in having different lengths of the arms and different angles between the arms. There is no previous record of *Cucumarites* from the Jurassic of western India.

Type horizon and type localty: Kuldhar Member

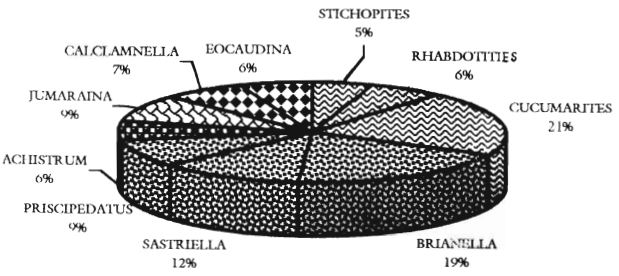


Fig. 4. Taxonomic diversity of the Callovian-Oxfordian holothurian sclerities based on minimum number of species.

of the Jaisalmer Formation; Jaisalmer, Rajasthan.

Cucumarites sp. A Soodan, 1986

(P1. I, fig. 10)

Cucumarites sp. A Soodan, 1986, p. 63, pl. 2, fig. f.

Description: Sclerite triradiate; arms solid, placed at unequal angles with respect to each other; arms long tapering towards distal end; circular in cross section; central area small. Length of the complete arm 0.18mm and angle between the arms 115°, 120° and 125°.

Distribution and Remarks: *Cucumarites* sp. A. was described by Soodan (1986) from the Triassic sequence of the Spiti Himalaya, India. The present species under description compares well with the species described by Soodan (1986) in having similar angles between the arms (115°, 120°, 125°) and in having thin, long arms.

Family **Calclamnidae** Frizzell & Exline, 1955

Genus ***Calclamnella*** Frizzell & Exline, 1955

Calclamnella sp.

(P1. I, fig. 17)

Description: Sclerite in the form of elongate, rectangular plate, incomplete outline; perforations rounded to sub-rounded, of variable size.

Remarks: Few incomplete specimens have been recovered from the present material. Hence, no specific identification has been attempted.

Genus ***Eocaudina*** Martin, 1952

Eocaudina sp.

(P1. I, fig. 4)

Description: Sclerite in the form of perforate plate, flat outline incomplete; perforation circular to elliptical.

Remarks: A few incomplete specimens have been recovered from the Pohra material.

Family **Achistridae** Frizzell & Exline, 1955.

Genus ***Achistrum*** Etheridge, 1885

Achistrum monochordata Hodson, Harris & Lowson, 1956

(P1. I, fig. 16)

Achistrum monochordata Hodson, Harris & Lowson, 1956 p.340, text fig. 10, 11-Soodan, 1974, p. 102, fig. 4.

Description: Sclerite in the form of a hook, shank narrow, broken and uniform; circular in cross-section, eye elliptical; the perforation is divided into two parts by a single cross-bar.

Distribution and Remarks: The species *Achistrum monochordata* was originally described by Hodson *et al.* (1956), from the Oxford Clay of Red Cliff near Weymouth (Dorset). Soodan (1974) reported and described this species from the Upper Jurassic rocks encountered in Godpur shallow well-I, CC8 (136-137.25mm) of Kachchh. The present species under description closely resembles *Achistrum monochordata* Hodson *et al.* (1956), but differs in having elliptical eyes.

Family **Priscopedatidae** Frizzell & Exline, 1955. Rev. Soodan, 1975

Genus ***Brianella*** (Soodan) Huddleston, 1982

Brianella giganta Soodan, 1975

(P1. I, fig. 6)

Fletcherina giganta Soodan, 1975, pp. 219-220, pl. 1, figs. 3-4; text-figs. 19-20.

Description: Sclerites in the form of tables, cross-shaped disc, with four radiating arms; arms solid, in one plane, unequal in length, and at right angles or nearly so with respect to each other, tapering distally, circular to subcircular in cross-section, one arm is bent at the distal end; spire very short with four-footed stirrup; circular central perforation. Diameter 0.53 mm along one set and 0.52 mm along the another set of arms.

Distribution and Remarks: Soodan (1975) described this species from the Bathonian-Callovian rocks of the Jhurio Formation, Jumara dome, Kachchh, India. The present species under study compares well in all aspects with *Brianella giganta* (Soodan, 1975).

Brianella acuta (Soodan, 1975)

(P1. I, fig. 5)

Fletcherina acuta Soodan, 1975, p. 220, pl. 1, figs. 5, 6; text figs. 21, 22.

Description: Sclerites in the form of tables, disc cross-shaped, with four solid radiating arms; solid arms in one plane, making two acute and two obtuse angles with each other; arms are unequal in length; in cross section circular to subcircular; tapering distally; spire short; stirrup four-footed; central perforation circular. Diameter 0.25mm along one set of arms and 0.28mm along another set of arms; angle between different sets of arms are 80° and 100°.

Distribution and Remarks: *Brianella acuta* was originally described by Soodan (1975) from the Bathonian-Callovian rocks of the Jhurio Formation, Jumara dome, Kachchh, India. The present species under study compares well with *Brianella acuta* (Soodan, 1975) in all characters.

Brianella pentaradiata Soodan, 1975

(P1, I, fig. 8)

Fletcherina pentaradiata Soodan, 1975, p. 181, pl. 1, figs. 5-6.

Description: Sclerite in the form of tables with five solid radiating arms; arms radiating in one plane, unequal in length; gradually tapering towards distal end; circular or elliptical in cross section; arms placed at unequal angles with each other; disc with spire and stirrup, central perforation circular and small. Diameter of the complete arms 0.11, 0.21, 0.18, 0.29mm.

Description and Remarks: The species was originally described by Soodan (1975) from the Upper Jurassic rocks encountered in Godpur shallow well 1, CC8 bed Kachchh, India. The single specimen under study resembles *Brianella pentaradiata* Soodan (1975) in all characters.

Genus ***Sastriella*** Soodan, 1975

Sastriella sp. a

(P1, I, fig.11)

Description: Sclerites in the form of tables; disc with perforated radiating arms, arms in one plane, rectangular to subrectangular in cross-section, unequal in length, only one circular to subcircular hole.

Remarks: A solitary incomplete specimen has been recovered from the present material.

Sastriella sp. b

(Pl.1, fig.15)

Description: Sclerites in the form of tables, disc with six perforated radiating arms, arms in one plane, unequal in length, tapering distally; angle between two adjacent pairs of arms are 50°, 60°, 80°.

Discussion: This species differs from all other known species of *Sastriella* in having six perforated radiating arms of the disc. This may represent a new species, but is kept under open nomenclature for want of more material.

Genus ***Priscopedatus*** Schlumberger, 1890 emend. Soodan, 1975

Priscopedatus sp.

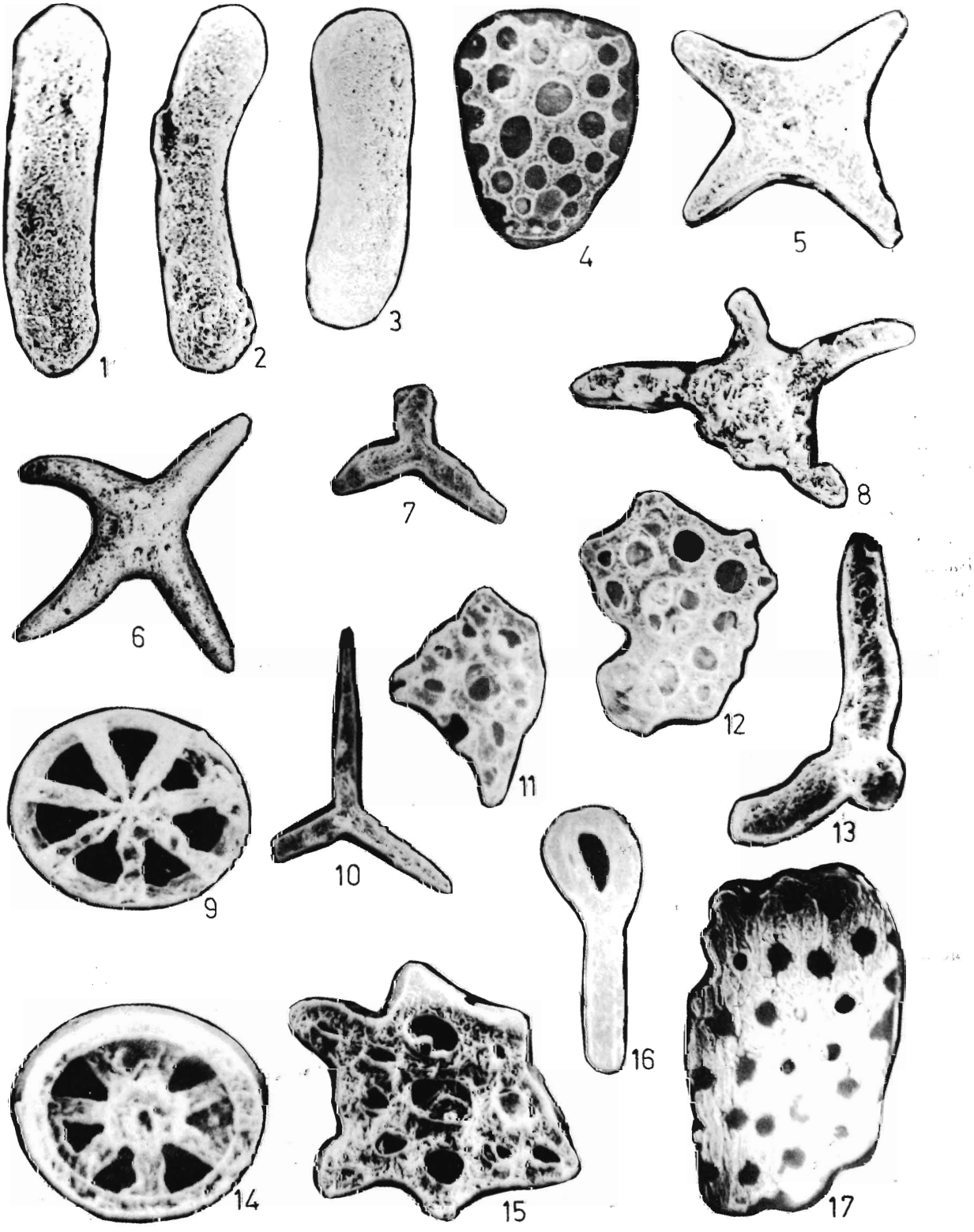
(P1. I, fig. 12)

Description: Sclerite in the form of tables, irregular spire and stirrup with perforated disc, distinct four central perforations.

Remarks: Very few incomplete specimens have been recovered in the present assemblage. The specimen does not show any similarity to the already

EXPLANATION OF PLATE I →

1. ***Stichopites mortenseni*** Deflandre-Rigaud (VPL-KD/12/3), X 140.
2-3. ***Rhabdotites* cf. *R. mortenseni*** Deflandre-Rigaud (VPL-KD/12/1,2), x 140.
4. ***Eocaudina*** sp. (VPL-KD/1/65), x 75.
5. ***Brianella acuta*** (Soodan) (VPL-KD/1/58), x 100.
6. ***Brianella giganta*** Soodan (VPL-KD/1/60), x 125.
7. ***Cucumarites soodanii*** n. sp. (VPL-KD/1/54), x 300.
8. ***Brianella pentaradiata*** Soodan (VPL-KD/11/6), x 90.
9,14. ***Jumaraina indica*** Soodan (VPL-KD/1/56,57), x 120.
10. ***Cucumarites*** sp. a (VPL-KD/1/55), x 150.
11. ***Sastriella*** sp. a (VPL-KD/16/55), x 110.
12. ***Priscopedatus*** sp. (VPL-KD/6/56), x 70.
13. ***Cucumarites spitiensis*** Soodan (VPL-KD/1/53), x 180.
15. ***Sastriella*** sp. b (VPL-KD/6/57), x 70.
16. ***Achistrum monochordata*** Hodson, Harris & Lowson (VPL-KD/1/64), 160.
17. ***Calclamnella*** sp. (VPL-KD/11/9), x 70.



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known species of this genus.

Family ***Theellidae*** Frizzell & Exline, 1955

Genus ***Jumaraina*** Soodan, 1973

Jumaraina indica Soodan, 1973

(Pl. I, figs. 9, 14)

Description: Sclerites in the form of wheels; spokes seven, outline circular with smooth periphery, spokes thick and broad in the outer 3/4th part, abruptly thinning towards the central part, interspoke space increases towards the rim, rim thinning at an angle with the plane of the wheel. Curving upwards and inwards, much broader on the dorsal side, smooth inner margin; on the ventral side the central portion is small, smooth and imperforate, while on the dorsal side it contains a large hemispherical tubercle. Diameter of specimen 0.25mm.

Distribution and Remarks: *Jumaraina indica* was originally described by Soodan (1973) from the Bathonian-Callovian rocks of the Jhurio Formation, Jumara dome, Kachchh, Gujarat, India. The present species closely resembles *Jumaraina indica* Soodan (1973).

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