

THE GENUS *HALKYARDIA* FROM KUTCH, WESTERN INDIA

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ABSTRACT—*Halkyardia minima* var. *indica*, nov. has been described from the limestones and marls of Lutetian age occurring in Kutch, Western India. This is the first record of this genus from India.

INTRODUCTION

THE presence of this genus was noticed by the author in marls and limestones of the Middle Kirthar (Lutetian) age (Nuttall 1926, Tewari 1952) outcropping in the vicinity of the village Miani ($23^{\circ}7'$: $69^{\circ}6'$) in South-Western Kutch. The genus is of great stratigraphic importance for correlating the beds of Eocene and Oligocene ages. This is the first report of the genus from this country. A large number of specimens were isolated for study.

Halkyardia is known from the Eocene of France (Herron—Allen and Earland 1919),

Molukka (Bursch 1947) and New Zealand (Dorreen 1948). According to Galloway (1933) and Stainforth (1948) it occurs in the basal Oligocene of North America.

The systematic position of this genus has long been disputed and different authorities have assigned it to different families tracing its ancestry from altogether different sources. In this paper Cushman's classification has been followed.

STRATIGRAPHY

The Tertiary rocks which are well exposed in this area are folded in a low anticline.

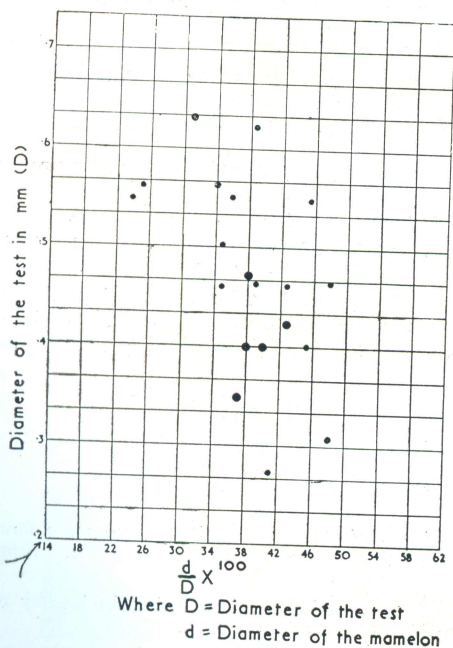


FIG. 1—Scatter diagram of diameter of the test and diameter of mamelon in percentage of diameter of the test for *Halkyardia minima indica* Tewari.

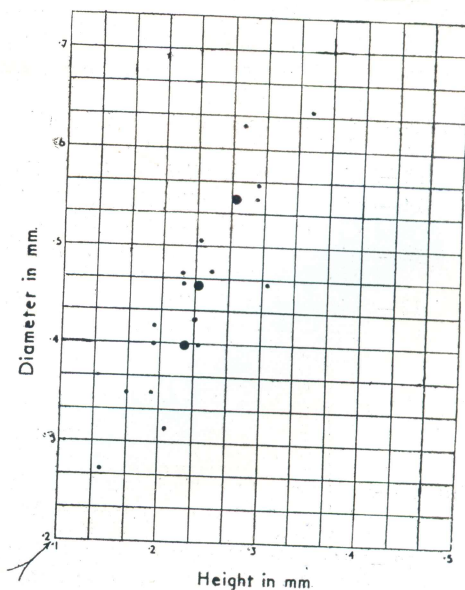


FIG. 2—Scatter diagram of diameter of the test and height of the test for *Halkyardia minima indica* Tewari.

In brief the sequence of beds in this area is as follows (in descending order).

8. Clay, shales, grits and bands of limestones. A band contains a large species of *Ostrea*. } Manchar.

7. Shales with bands of limestones containing small foraminifers, molluscs, *Balanus* etc.—400'. } Post-Gaj

6. Shales with intercalated bands of limestones, marls, and ferruginous sandstones. Limestones and marls are highly fossiliferous which have yielded species of *Miogypsina*, *Taberina* (= *Orbiculina*) *malabarica*, *Austrotrillina howchini*, *Lepidocyclus* sp., teeth of fishes, ostracodes and molluscs.—900'. } Gaj.

5. Loose coarse grained sandstones with a few shales. The sandstones show current bedding. These have not yielded any definite fossils.—200'. } ?

4. Intercalated bands of limestones, marls and a few shales highly fossiliferous with species of *Nummulites*, *Discocyclus*, *Alveolina*, *Linderrina*, *Dictyoconoides*, *Halkyardia* etc.—500'. } Middle Kirthar

3. Grey shales which are gypseous and unfossiliferous. } 50' Laki.
2. Mottled argillaceous deposit-unfossiliferous }
1. Deccan Traps.

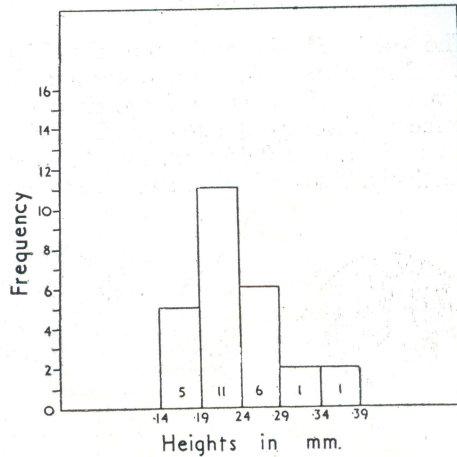


FIG. 3—Histogram of heights of the test of *Halkyardia minima indica* Tewari representing that the specimens falling within the group 0.19 mm.—0.24 mm. in height are most common in the collection.

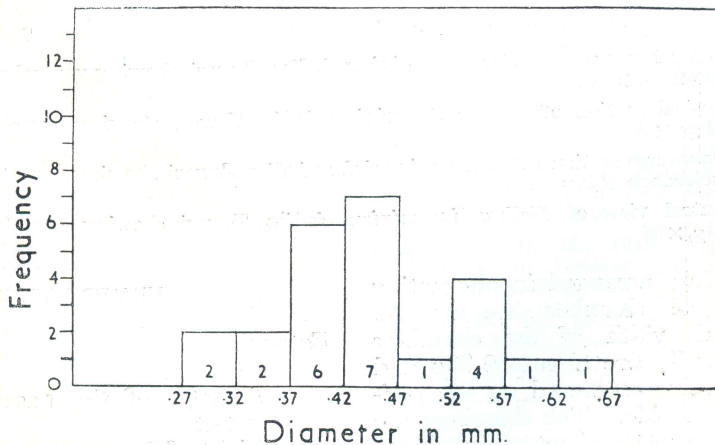


FIG. 4—Histograms of diameters of the test of *Halkyardia minima indica* Tewari representing that the specimens with diameters from 0.42-0.47 mm. are most common in the collection.

SYSTEMATIC DESCRIPTION

Family CYMBALOPORIDAE

Genus HALKYARDIA Heron-Allen and

Earland, 1919

HALKYARDIA MINIMA var. INDICA nov.

Text-figs. 5—9

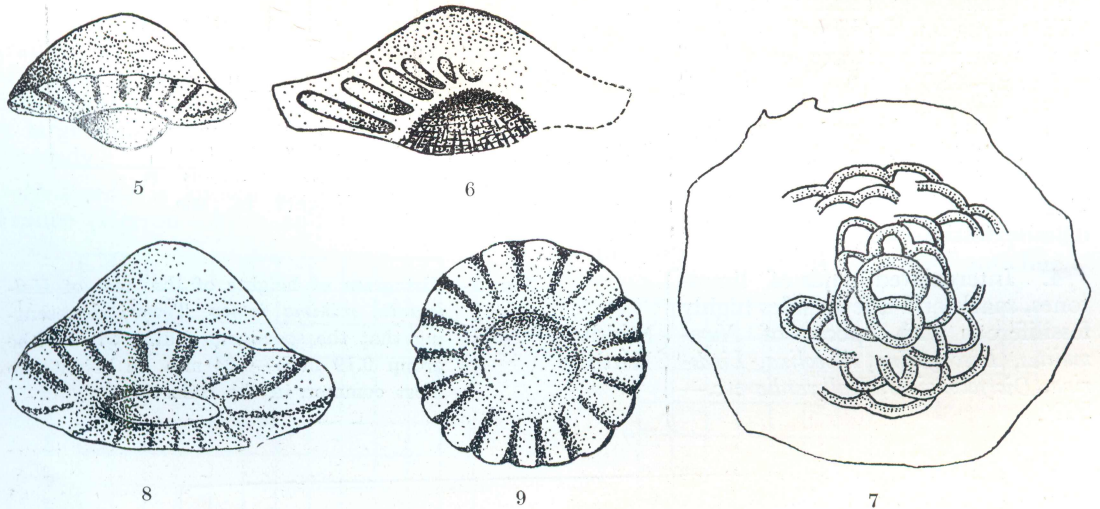
The test is circular and unequally biconvex. The dorsal side is more convex than the ventral and shows a large number of chambers. Average diameter and height of the test is about 0.46 mm. and 0.24 mm. respectively. The early chambers are trochoid

On the ventral side elongated chambers are seen arranged along several radii. The central portion is occupied by an umbilical plug which is like a mamelon. This is of secondary shell material which is perforate.

In vertical section the length and height of the chambers near the periphery are about 165μ and 30μ respectively. The embryonic chambers are circular.

In transverse section a nephrolepidine nucleconch surrounded by auxiliary and inter-auxiliary chambers is seen. The other chambers are arcuate and gradually increase in dimensions from centre to periphery.

There is no aperture except the perforations of the umbilical plug and the walls.



Figs. 5 and 8—Lateral views of *Halkyardia minima indica* Tewari showing ventral plug and arcuate chambers, $\times 96$

6—Vertical section of *Halkyardia minima indica* Tewari showing chambers and ventral plug, $\times 96$

7—Transverse section of *Halkyardia minima indica* Tewari showing arcuate chambers and nucleconch, $\times 170$

9—Ventral view of *Halkyardia minima indica* Tewari showing chambers and ventral plug, $\times 96$

but later ones are arranged in alternating annular series; the chambers are arcuate. The length and width of the chambers including the walls are about $50-70\mu$ and $40-50\mu$ respectively, measured on the periphery of the dorsal side. The chambers are dorsoventrally elongate and set obliquely to the base. Occasionally epitheca—a porous shelly material is seen near the apex.

MEASUREMENTS

External:

Diameter of the base of the test	270–640 μ
Height of the test	140–350 μ
Length of arcuate chambers on dorsal side	55–70 μ

Width of arcuate chambers on dorsal side	40- 50 μ
Length of chambers on ventral side	200-300 μ
Number of chambers at ventral side	17- 23

Vertical Section :

Diameter of I Embryonic chamber	21- 36 μ
Diameter of II Embryonic chamber	21- 44 μ
Diameter of ventral plug	125-255 μ
Perforations of ventral plug	4- 8 μ

Transverse Section :

Length of I Embryonic chamber	28- 80 μ
Width of I chamber	24- 60 μ
Length of II chamber	36- 96 μ
Width of II chamber	28- 68 μ
Length of arcuate chambers near the centre	about 55 μ
Width of arcuate chambers near the centre	about 40 μ
Thickness of walls of chambers	about 4 to 8 μ

COMPARISON

The variety now described comes very close to *H. minima* (Liebus 1911) and differs from other known species in shape, size, and measurements. The Kutch specimens are convex on the ventral side with a prominent plug, while in *H. minima* the ventral side is flat to concave. Moreover, the Kutch specimens are smaller in size with longer and fewer ventral chambers.

OCCURRENCE AND ASSOCIATION

Halkyardia minima var. *indica* nov. occurs in the Nummulitic limestone outcropping in

the vicinity of the village Miani (23°7' : 69°6'), Kutch, Western India.

It occurs in association with *Nummulites acutus*, *N. obtusus*, *N. maculatus*, *Assilina exponens*, *Discocyclina dispansa*, *D. javana* var. *indica*, *D. undulata*, *D. sowerbyi*, *Alveolina elliptica*, *Dictyoconoides cooki*, and *Linderina* sp. In addition to the above, oogonia of *Chara*, *Bairdia* cf. *subdeltoidea*, together with many fossil ostracoda and thick shelled molluscs, whose identifications are still in progress, are also found. The Nummulitic limestone containing the above assemblage belongs to the lower part of the Middle Kirthar Series (Lutetian—Middle Eocene) of India.

ACKNOWLEDGEMENTS

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