

## A NEW SPECIES OF GENUS *INDICOLA* FROM THE MIDDLE EOCENE, KUTCH, WESTERN INDIA

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### ABSTRACT

A new species of the genus *Indicola* Singh and Kalia (1970) is being described from the Middle Eocene rocks exposed around Jhadwa, southwestern Kutch. Besides this, *Indicola rajasthanensis* Singh and Kalia, the type species from Bikaner has also been recorded. Validity and probable development of the genus has been discussed.

### INTRODUCTION

Singh and Kalia (1970) established the family Indicolidae under the superfamily Globigerinacea. It is characterised by an ellipsoidal-conical umbilical cavity with a characteristic structure and multiple interio-marginal aperture. Jauhari (1974) reported the occurrence of the genus from Lutetian rocks of Vinjhan-Miani area in western Kutch. Singh (1980) erected a new subspecies *Indicola rajasthanensis taptiensis* from the Upper Eocene rocks exposed in the Ghala nala, Surat-Broach area.

During the micropalaontological study, besides *Indicola rajasthanensis* Singh and Kalia, a new species *Indicola kutchensis* is being recorded from the Middle Eocene rocks, which are exposed in the continuous Ratchelo nala section, from a place about 3.2 km south of Baranda village (23°34'20" : 68°43'10") up to Jhadwa village (23°30'30" : 68°36'30") in southwestern Kutch. The Middle Eocene rocks are about 90 metres in thickness and comprise shales, clays, marls, marly limestones and limestones of various colours. These rocks are divisible into five biostratigraphic zones based on smaller foraminifers (mainly planktonic), which are as follows :

Lower Oligocene rocks

*Truncorotaloides rohri* Zone  
*Gybulinoides beckmanni* Zone  
*Globorotalia lehneri* Zone  
*Discorbis metingiensis* Zone  
 Faunistically Barren Zone

Middle  
Eocene

Lower Eocene rocks

The species *Indicola rajasthanensis* and *I. kutchensis* sp. nov. have been recovered from the rocks belonging to *Globorotalia lehneri*—*Truncorotaloides rohri* Zones.

### SYSTEMATIC DESCRIPTION

*Superfamily* Globigerinacea CARPENTER, PARKER  
 AND JONE, 1862  
*Family* Indicolidae SINGH and KALIA, 1970  
*Genus* *Indicola* SINGH and KALIA, 1970

*Indicola rajasthanensis* SINGH and KALIA, 1970

(Pl. I—3-5)

*Indicola rajasthanensis* Singh and Kalia, 1970, *Micropal.*, vol. 16, no. 1, pp. 77-80, pls. 1-2.

*Measurements* (in mm) :

	Diameter of test		Max. height
	longer	shorter	
Hypotype No. LUIP 1028	0.387	0.313	0.236
LUIP 1029	0.400	0.350	0.275
LUIP 1030	0.350	0.336	0.236
LUIP 1031	0.425	0.300	0.300
LUIP 1032	0.313	0.250	0.200
LUIP 1033	0.236	0.213	0.125

*Remarks* : The illustrated and studied specimens are identical in most of the characters with the type species described by Singh and Kalia (1970) from the Middle Eocene rocks of Rajasthan, except for a minor variation in number of chambers in the last whorl, periphery and apertural lips. The number of the chambers in Kutch specimens are less than the type species. The present forms are characterized by highly lobulate periphery and protruded apertural lips.

This species also differs from *Indicola rajasthanensis taptiensis* Singh (1980) described from the Upper Eocene rocks of Surat-Broach area, in having more number of volutions and in lacking semicircular apertural tube with lip.

*Horizon* : Babia Stage (Middle Eocene).

*Locality* : Nala section, about 3.6 km S 15° E of Baranda village, Kutch, India.

*Repository* : In author's collection hypotype Nos. LUIP 1028-1033, Department of Geology, University of Lucknow, Lucknow.

*Indicola kutchensis* sp. nov.

(Plate I—1, 2, 6 and 7)

*Description* : Test trochospiral, plano-convex, ventral side convex and only chambers of last whorls visible, dorsal side evolute, flat with granules on the central part, periphery slightly lobulate, tending to become entire in some forms, distinctly carinate, volutions 2 to 3, last whorl made up of 7 to 9 chambers, gradually increasing in size, septal suture distinctly elevated, directed backwards, test coarsely perforate, favose, the perforations lying in pits larger in diameter than the pores, umbilicus ellipso-conical, deep with distinctly raised margin, divided into two parts by a prominent and raised cellular partition running the entire length of the umbilical cavity, parallel to the longer diameter of the ellipse with a number of transverse filaments on both sides of the partition; wall bilamellar, calcitic and radial in microstructure; primary aperture interiomarginal, multiple, 5 to 14 in number depending on size of test in a row at the base of the last chamber, generally with a slightly pronounced apertural lip.

*Measurements* (in mm) :

	Diameter of test		Max. height
	longer	shorter	
Holotype No. LUIP 1034	0.763	0.700	0.587
Paratype No. LUIP 1035	0.675	0.600	0.463
LUIP 1036	0.700	0.636	0.500
LUIP 1037	0.650	0.613	0.400
LUIP 1038	0.513	0.460	0.313
LUIP 1039	0.375	0.350	0.250
LUIP 1040	0.350	0.300	0.225

*Remarks* : The number of interiomarginal multiple apertures varies considerably from 5 to 14. The variation in number is probably related with the increase in the size of the test. Generally each multiple aperture shows a pronounced apertural lip. However, in large sized forms, the apertural lip is less pronounced.

The specimens under description differ from *Indicola rajasthanensis* Singh and Kalia, described from the Middle Eocene rocks of Rajasthan, in having distinctly elevated sutures. The apertural lip, though pronounced, is not protruded as found in *I. rajasthanensis*.

*Type Locality* : Nala section, about 3.6 km S 15° E of Baranda village, Kutch, India.

*Type Horizon* : Babia Stage (Middle Eocene).

*Repository* : In author's collection holotype No.

LUIP 1034, paratype Nos. LUIP 1035-1040, Department of Geology, Lucknow University, Lucknow.

#### DISCUSSION

The earliest report of the form similar in appearance to the genus *Indicola* Singh and Kalia (1970) was made by Haque (1962, for 1959). He doubtfully assigned this form to *Gyroidinella sindensis*, which was described from Meting Limestone (Lower Eocene), Hyderabad, west Pakistan. Later, Haque (1960) established a new genus *Soriella* under the family Anomaliniidae to receive this form with the following generic diagnosis :

"Test trochoid, probably attached during life by the flat to concave, evolute dorsal side; ventral side completely involute, the umbilical depression narrow, elongate, surrounded by a raised, unbroken rim sometimes having granulations on it; wall calcareous, perforate; dorsal side usually coarsely perforate, ventral side finely so; aperture peripheral, an arched opening at the base of the last chamber on the ventral side near the umbilicus; each chamber may also have opened into the umbilicus within the raised rim surrounding it".

He described in detail two species of this genus, namely, *Soriella schoechlei* and *Soriella orbicularis* from Lower to Middle Eocene rocks of western Pakistan. The form *Gyroidinella sindensis* was transferred to *Soriella sindensis* (Haque, 1960).

Singh and Kalia (1970) carried out a detailed study of the similar forms from the Middle Eocene of Rajasthan. Their studies showed that the form was of planktonic nature and could not be referred to any of the known genera. In order to receive this peculiar new genus, they erected a new family Indicolidae under the superfamily Globigerinacea. Their genus was established on the following generic diagnosis :

"Test umbilico-convex; periphery distinctly carinate, lobulate; chambers angular-conical; sutures distinct, depressed; septal sutures radial, directed backward; ventral side involute, with a deep ellipsoidal-conical umbilicus; umbilical surface covered by a layer of rectangular cells which extends to the exterior and borders the elliptical outline of the umbilical opening, umbilical cavity divided by a vertical triangular partition having similar cellular surface; apex of partition placed just below the ventral surface of the initial chamber; base of partition forming the longer diameter of the umbilical opening; partition attached to umbilical surface by filaments running horizontally and at right angles to it; primary aperture interiomarginal, multiple; wall bilamellar, calcitic; radial in microstructure, coarsely perforate; surface structure favose".

The comparison of generic diagnoses of *Soriella* Haque and *Indicola* Singh and Kalia is summarised below. Haque (1960) found the primary aperture to be a peri-

pheral, arched opening at the base of the last chamber and described the wall as calcareous, perforate in nature, whereas Singh and Kalia (1970) made detailed observations regarding wall microstructure and primary aperture. According to them, *Indicola* consists of bilamellar, perforate, calcitic wall, which is radial in microstructure; the primary aperture is interiomarginal, multiple. From the above comparison, it is apparent that either Haque's description of the genus lacked in details, particularly the wall structure and primary aperture, or the forms described from Sor Range, Quetta District and Meting Limestone, Hyderabad, western Pakistan are different. The details of internal structure, wall and aperture as worked out by Singh and Kalia (1970) seem to place the genus *Indicola* on firm footing and invalidate *Soriella*, which has been described with insufficient morphologic details. In the absence of detailed morphologic description of the latter, it would not be inappropriate to suggest that *Indicola* is a valid genus in place of *Soriella*, if the latter is not different.

According to El-Nagar (1971), the morphologic characters of the genus *Indicola*, particularly primary double septa, the spongy umbilical plug and the multiple aperture are more indicative of its benthonic nature than the planktonic habit and as such, the genus may be grouped under the family Eponididae. But since the genus possesses certain characters (like perforate, radially built, calcitic wall, bilamellar character and favose test surface) which are developed in response to planktonic mode of life, it is believed that the genus is planktonic in nature as suggested by Singh and Kalia (1970).

The authors have also studied the distribution of the genus *Indicola*. Besides Rajasthan, it has so far been reported from the early Tertiary rocks of Kutch and Surat-Broach. In Kutch and Rajasthan, it is present in the Middle Eocene rocks, while in Surat-Broach, its occurrence is observed in the late Eocene rocks (Singh, S. K. 1980). In the present area, the genus *Indicola* appears in the *Globorotalia lehneri* Zone and continues upto *Truncorotaloides rohri* Zone. Its frequency which is relatively high in the *Globorotalia lehneri* Zone goes down in the higher biozones.

Singh (1971) suggested that the genus *Praeindicola* Singh possibly gave rise to *Indicola*. The authors who have also studied the genus *Praeindicola* agree with the above suggestion. It is very likely that *Praeindicola*—an early Eocene form having an interiomarginal, multiple

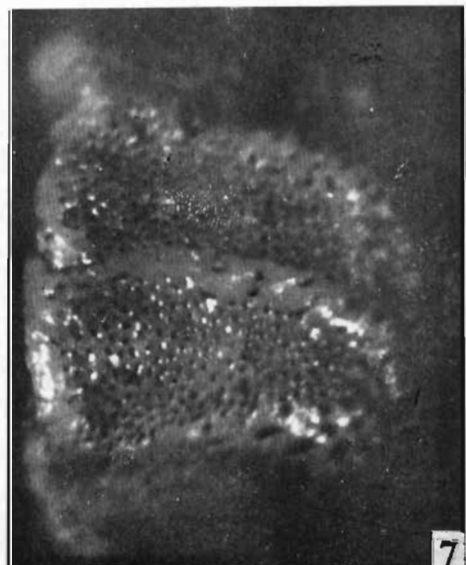
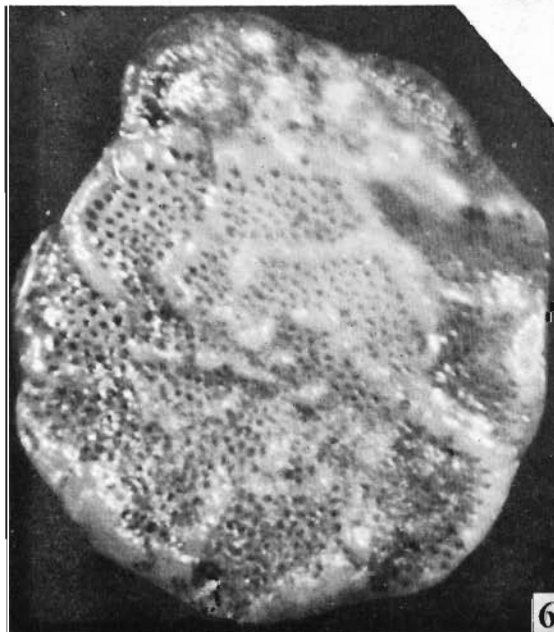
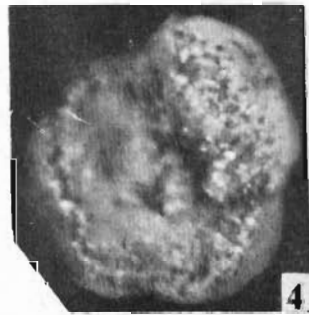
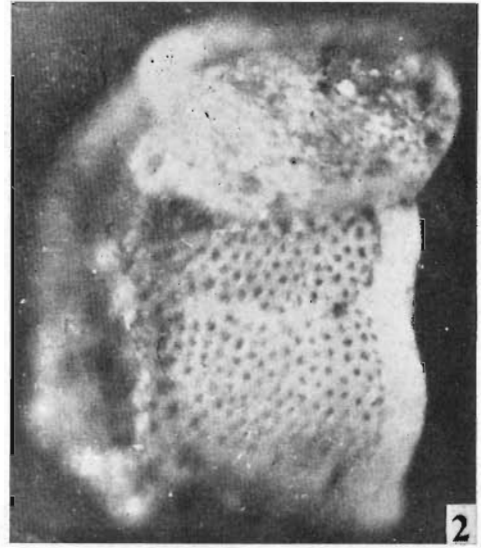
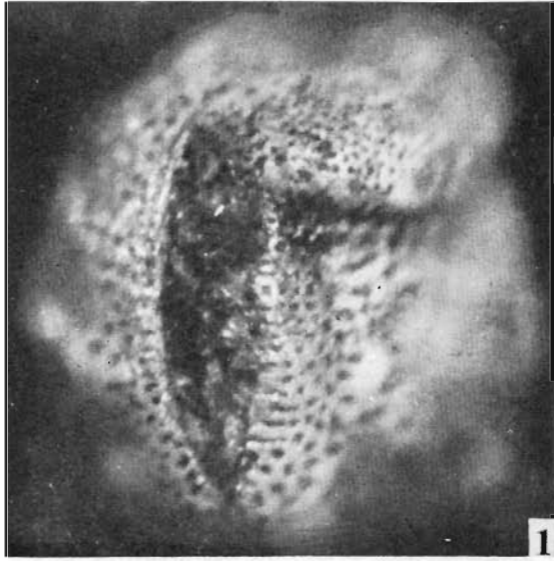
aperture, filamental mass in the umbilicus imparting a spongy appearance to the umbilical cavity, must have given rise to the genus *Indicola* during the early part of Middle Eocene by the acquisition of larger dimensions and a peculiar ellipsoidal-conical umbilical cavity with the linings of the cellular structure and a vertical umbilical partition.

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EXPLANATION OF PLATE

PLATE I

(All figures X 10<sup>9</sup> approx.)

1, 2, 6 and 7. *Indicola kutchensis* sp. nov.

1. Ventral view showing ellipsoidal-conical cavity with a longitudinal partition (Holotype No. LUIP 1034).
2. Apertural view showing multiple interiomarginal aperture with lip (Paratype No. LUIP 1036).
6. Dorsal side showing number of whorls and elevated suture (Holotype No. LUIP 1034).
7. Side view showing elevated suture (Holotype No. LUIP 1034).

3-5. *Indicola rajasthanensis* Singh and Kalia

3. Ventral view showing ellipsoidal-conical cavity with a longitudinal partition and depressed suture (Hypotype No. LUIP 1930).
4. Dorsal side showing number of whorls and depressed suture (Hypotype No. LUIP 1029).
5. Apertural view showing interiomarginal multiple aperture with lip (Hypotype No. LUIP 1029).