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LUTETIAN PLANKTONIC FORAMINIFERA FROM VINJHAN MIANI AREA, SOUTH WESTERN KUTCH, GUJRAT, INDIA

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ABSTRACT

A study of the microfaunal content of the rock samples of the fossiliferous light yellow marl and yellow limestone belonging to the Kirthar Series of the Vinjhan-Miani area, south-western Kutch, has brought to light some Middle Eocene Planktonic foraminifera, which appear to put this horizon close to Mohan and Soodan's *Globigerinoides kugleri—Globigerina frontosa* and *Orbulinoides beckmanni* zones in Beranda-Bernana region in Western Kutch.

INTRODUCTION

The Vinjhan—Miani area is situated on the western most end of Kutch, lying about 14 km away from the sea shore of western coast of India. It comes under the district Bhuj. The main contributions to its geology and micropalaeontology are from Tewari (1952,'56 and '60), Biswas (1965), Mohan and Soodan (1970) and Samanta (1969—'70). Sample collections were made in the year 1969 mainly with the purpose of obtaining micropalaeontological information about the area.

STRATIGRAPHY

The rocks of Eocene age in the Vinjhan—Miani area which, in general, have been termed Berwali Series by Biswas (op,cit.), are divisible into Kakdi and Babia stages equivalent to European stages of Ypresian and Lutetian respectively. Priabonian (Upper Eocene) has not been reported from here. Palaeocene rocks known as Madh Series are also not present. In contrast to the unfossiliferous nature of Kakdi stage, Babia stage is richly fossiliferous and has yielded abundant Middle Eocene microfossils like *Nummulities* sp., *Halkyardia*, *Alveolina* sp., *Assilina sp.*, *Discocyclina* sp. Tewari (op. Cit.) suggested a definite Lutetian age for the assemblage belonging to the marls and limestone of Babia stage, previously known as middle Kirthar series, on the basis of *Nummulites acutus*, *Nummulites obtusus*, *N. maculas*, *Assilina exponens*, *Discocyclina dispansa*, *D. javan* var. *indica*, *D. undulata*, *D. sowerbyi*, *Alkeolina elliptica*, *Dictyoconoides cooki*, *Halkyardia minima* var. *indica*.

MATERIAL

Rock samples analysed for their microforaminiferal content belong to the fossiliferous light yellow marl and yellow limestone horizons of Kirthar Series which is of Lutetian (Middle Eocene) age. The material was boiled in water with sodium carbonate for quite some time. Then it was wet screened, in which 50—, 60—, 100—, and 170— mesh sieves were used, and was finally dried up. The material so obtained yielded a rich assemblage of smaller foraminifera which included both planktonic and benthonic forms. Although benthonic forms were in abundance both in species and specimens, only planktonics, comparatively less, have been studied.

The following forms are present in the collection :

Globigerina frontosa Subbotina

Globigerina yeguaensis Weinzierl and Applin

Globigerina linaperta Finlay

Globorotalia broedermanni Cushman

Turborotalia centralis Bermúdez

Truncorotaloides topilensis (Cushman)

Truncorotaloides rohri Brönimann and Bermúdez

Globigerinatheka barri Brönimann.

Globigerinoides sp.,

Inordinatosphaera indica Mohan and Soodan

Chiloguembelina tenuis (Todd)

DISCUSSION

Planktonic assemblage is suggestive of its tentative correlation with Mohan and Soodan's (*op. cit.*) combined *Globigerinoides kugleri—Globigerina frontosa* and *Orbulinoides beckmanni* zones in Beranda-Bernana region of Western Kutch, India.

The distinctive forms of *Globigerinoides kugleri—Globigerina frontosa* zone are *Globorotalia lehneri* Cushman and Jarvis, *Globigerinoides kugleri* Bolli, Loeblich and Tappan, *Truncorotaloides topilensis* (Cushman), *Inordinatosphaera indica* Mohan and Soodan, *Pseudohastigerina micra* (cole), *Catapsydrax dissimilis* (Cushman and Bermúdez) Mohan and Soodan which appear first in this zone. The forms disappearing at the top of this zone are *Globigerina frontosa* Subbotina, *Globigerinoides higginsi* Bolli and *Globorotalia spinuloinflata* (Bandy).

The appearance of *Globigerinatheka barri* Brönnimann, besides the zone marker, marks the beginning of *Orbulinoides beckmanni* zone. Other characteristic forms of this zone which are also found in the preceding one are *Globigerina yeguaensis* Weinzierl and Applin, *Turborotalia centralis* (Cushman and Bermúdez), *Globigerinoides kugleri* (Bolli, Loeblich and Tappan), *Globorotalia crassata* (Cushman), *Truncorotaloides topilensis* Cushman, *Inordinatosphaera indica* Mohan and Soodan, *Truncorotaloides rohri* Brönimann and Bermúdez. But *Truncorotaloides topilensis* Cushman and *Orbulinoides beckmanni* (Saito) do not extend above this zone.

While analysing the biostratigraphic significance of these forms for an exact correlation of the assemblage with the standard biostratigraphic zones of Bolli (1957) and Bandy (1964), following three facts are observed in our assemblage:

(1) The assemblage is characterized by the absence of zone markers which, combined with a limited number of planktonic species, renders the feasibility of precise correlation of the present assemblage with standard zones difficult. Such forms as those having shorter zonal range and showing strict preference for a particular biostratigraphic zone are rare.

(2) The Forms *Globigerina frontosa* Subbotina and *Globigerinatheka barri* Brönimann, hitherto reported from the above described zones separately, are found here occurring together. This simultaneous occurrence of the two is contrary to the views of Bolli (1957) and Mohan and Soodan (1970), as, in their opinion, *Globigerina frontosa* becomes extinct in *Globigerinoides kugleri—Globigerina frontosa* zone and *Globigerinatheka barri* appears first in *Orbulinoides beckmanni* zone.

(3) Third characteristic of the assemblage is the occurrence of *Globorotalia bröedermanni* Cushman and Bermúdez which appears first at the base of *Globorotolia rex* zone (Ypresian, Lower Eocene) in Trinidad in a highly evolved stage and continues into the Lutetian (Middle Eocene) stage, becoming extinct at the top of *Globigerapsis kugleri* zone (Bolli, 1957). Its presence in an assemblage having resemblance with the upper part of *Globigerinoides kugleri—Globigerina frontosa* zone and the whole of *Orbulinoides beckmanni* zone is noteworthy.

From the above discussion, it seems that the assemblage can be correlated with the combined *Globigerinoides kugleri—Globigerina frontosa* and *Orbulinoides beckmanni* zones of Mohan and Soodan (1970). This conclusion becomes more apparent when the occurrence of *Truncorotaloides topilensis* (Cushman) and *Inordinatosphaera indica* Mohan and Soodan is noticed. They do not cross the lower and upper limits of the above described zones. *Globigerinoides kugleri—Globigerina frontosa* zone is equivalent to the upper part of *Globigerina frontosa* and *Truncorotaloides topilensis* zones of Bandy (1964) and the combined *Globigerapsis kugleri* and *Globorotalia lehneri* zones of Bolli (1957), see Mohan and Soodan (1970).

SYSTEMATIC DESCRIPTION

Order	Foraminiferida	Eichwald, 1830
Super family	Globigerinacea	Carpenter, Parker and Jones, 1862
Family	Globigerinidae	Carpenter, Parker and Jones, 1862
Genus	*Globigerina*	d'Orbigny, 1826

Globigerina frontosa Subbotina

(Plate I—1 a, b, c)

Globigerina frontosa Subbotina, 1953, p. 84.

Globigerina boweri Bolli, 1957, p. 163.

Remarks: Globigerina frontosa Subbotina was first recorded from the zone of conical *Globorotalia* (Lower-Middle Eocene) and *Acarinina* zone (Upper Eocene) and later from the Kiev stage (Upper Eocene) of Moldavia. In India, it has been reported from the Middle Eocene rocks of Lakhpat (Samanta, *op. cit.*) and Beranda—Bernana region of Kutch (Mohan and Soodan, *op. cit.*) and also in Vinjhan—Miani area. (Measurement: Length 0.23 mm; Breadth 0.21 mm.)

Globigerina linaperta Finlay

(Plate I—3)

Globigerina linaperta Finlay, 1939, p. 125.

Remarks: The type species was first recorded from the Middle Eocene of New Zealand. Bolli (1957) recorded it from Lizard Springs (Lower Eocene), Navet (Middle Eocene) and San Fernando (Upper Eocene) formations of Trinidad. In Navet formation, it was found in *Porticulasphaera mexicana* zone (—*Oribulinoides beckmanni* zone). Samanta (*op. cit.*) has reported it from Middle and Upper Eocene formations of Kutch and Assam. (Measurement: Length 0.18 mm.; Breadth 0.16 mm.).

Globigerina yeguaensis Weinzierl and Applin

(Plate I—4 a, b, c)

Globigerina yeguaensis Weinzierl and Applin, 1929, p. 408.

Remarks: The species was first reported from Yegua formation (Middle Eocene) of Texas and has been found to be widely distributed in the Middle and Upper Eocene. Bolli (*op. cit.*) recorded it from Navet and San Fernando formations of Trinidad. In India, it has been reported from Middle Eocene formation of Kutch and Assam. (Measurement : Length 0.33 mm.; Breadth 0.21 m.m.)

Genus Inordinatosphaera Mohan and Soodan, 1967

Inordinatosphaera indica Mohan and Soodan

(Plate I—4)

Inordinatosphaera indica Mohan and Soodan, 1967, p. 24.

Remarks: This species has been reported from Middee Eocene rocks only from India. (Measurement : Diametre (Max.) 0.39 mm.; Diameter (Min.) 0.36 m.m.)

Family Globorotaliidae Cushman 1927

Subfamily Globorotaliinae Cushman, 1927

Genus Globorotalia Cushman, 1927

Globorotalia bröedermanni (Cushman and Bermúdez)

(Plate II—3 a, b, c)

Globorotalia (Truncorotalia) bröedermanni Cushman and Bermúdez, 1949, p. 40.

Globorotalia bröedermanni (Cushman and Bermúdez), Bolli, 1957, p. 80.

Remarks: The type species, originally reported by Cushman, occurs in the Lower and Middle Eocene rocks of Trinidad (Bolli, 1957), and Jacaguas group (Middle Eocene) in Puerto Rico (Pessango, 1961).(Measurement: Length 0.27 mm.; Breadth 0.26 mm.).

Genus Turborotalia Cushman and Bermúdez, 1949

Turborotalia centralis Cushman and Bermúdez

(Plate II—2 a, b, c;—5 a, b, c)

Globorotalia centralis Cushman and Bermúdez, 1937, p. 26.

Globorotalia (Turborotalia) centralis Cushman and Bermúdez, 1949, pp. 44-45.

Acarinina centralis Subbotina, 1953, pp. 237-239.

Turborotalia centralis Bermúdez, 1961, pp. 1317-1319.

Remarks: This species, originally reported from Upper Eocene deposits of Cuba, has been found to be of wide occurrence in Middle and Upper Eocene formations of different parts of the world. In Kutch and Assam, it is confined in the Middle Eocene rocks. (Measurement: Length 0.56 mm.; Breadth 0.41 mm).

Subfamily Truncorotaloidinae Loeblich and Tappan, 1961

Genus Truncorotaloides Brönnimann and Bermúdez, 1953

Truncorotaloides rohri Brönnimann and Bermúdez

(Plate I—6 a, b, c; Plate II—1 a, b, c)

Truncorotaloides rohri Brönnimann and Bermúdez, 1953, pp. 818-819.

Remarks: The type species has been reported from the Eocene of Trinidad. It ranges from (*Hantkenina aragonensis* zone?) *Globigerapsis kugleri* zone to *Truncorotaloides rohri* zone (Navet formation) in Trinidad. In India, it occurs in the Middle Eocene rocks of Kutch and Assam. (Measurement:—Length 0.39 mm.; Breadth 0.29 mm.).

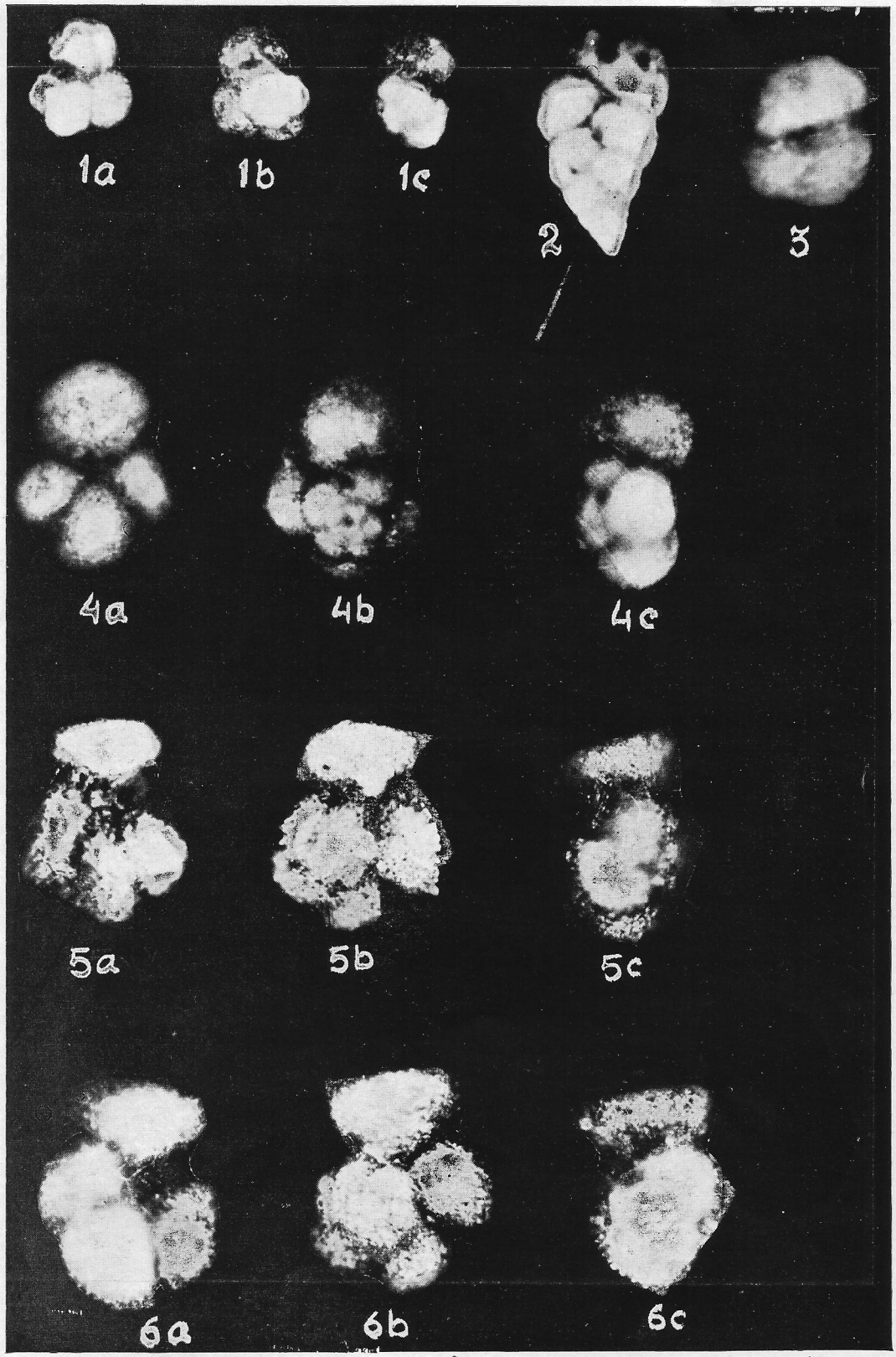
Truncorotaloides topilensis (Cushman)

Plate 1,—5 a, b, c)

Globigerina topilensis Cushman, 1925, p. 7.

Truncorotaloides topilensis Bolli, 1957, p. 170.

Remarks: This species was first recorded from Tantoyuca formation of Mexico. It has been recorded from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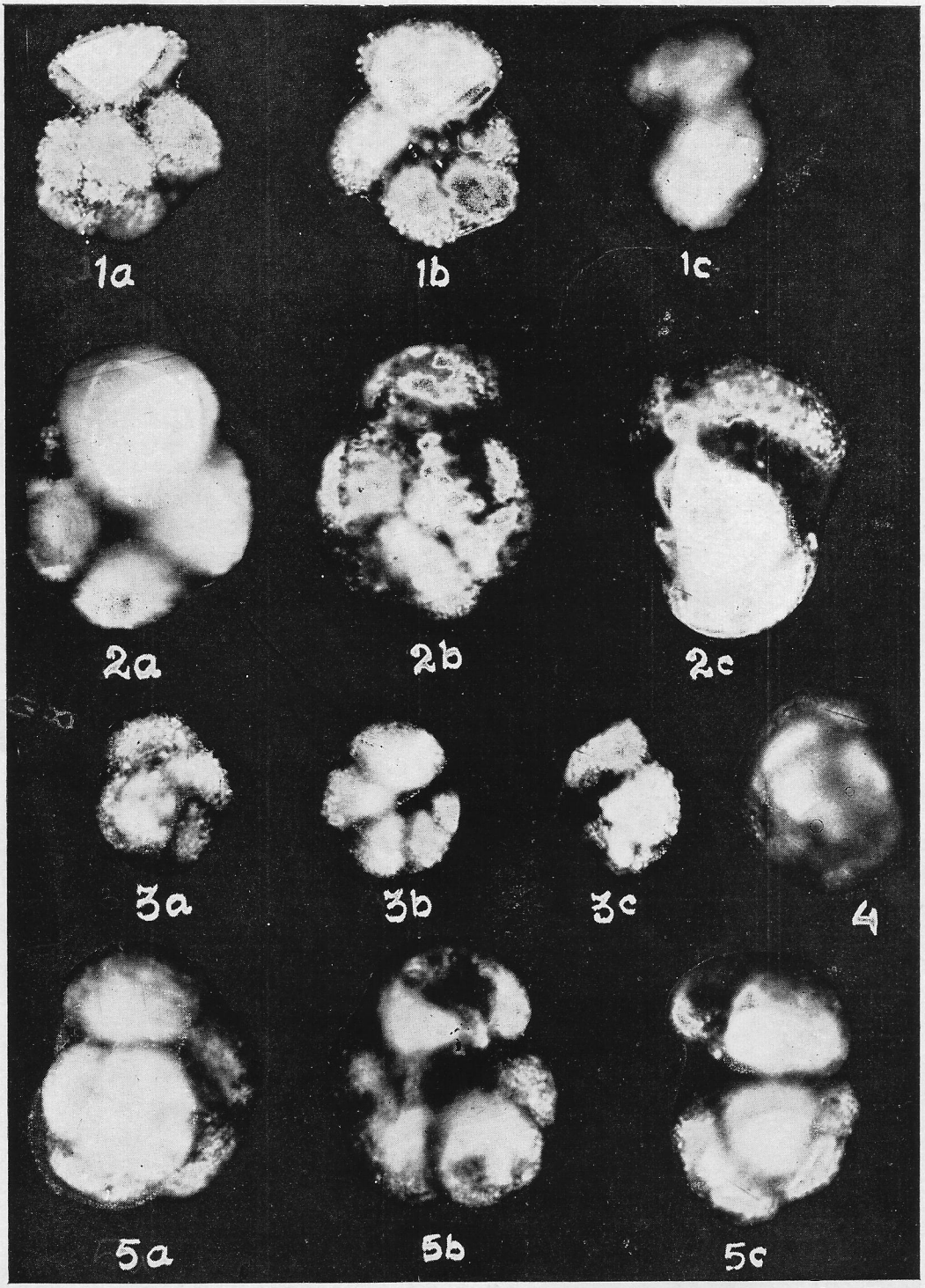
1a
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1c
2a
2b
2c
3a
3b
3c
4
5a
5b
5c

Middle Eocene rocks only. In India, its occurrence has been reported from Kutch and Assam. (Measurement: Length 0.41 mm.; Breadth 0.29 mm).

Family Chiloguembelinidae Reiss, 1963

Genus Chiloguembelina Loeblich and Tappan, 1956

Chiloguembelina tenuis (Todd)

(Plate I—2)

Gumbelina tenuis Todd, 1957, p. 303.

Remarks: Chiloquembelina tenuis (Todd) originally described from the Upper Eocene of Saipan, Marina Islands, has been reported from the Middle Eocene rocks of Kutch and Assam. (Measurement: Length 0.36 mm.; Breadth 0.19 mm.).

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EXPLANATION OF PLATES

PLATE I

1. *Globigerina frontosa* Subbotina
   a, umbilical view; b, spiral view; c, apertural view; ×83
2. *Chiloguembelina tenuis* (Todd)
   Side view; ×108
3. *Globigerina linaperta* Finlay
   Umbilical view; ×139
4. *Globigerina yeguaensis* Weinzierl and Applin
   a, umbilical view; b, spiral view; c, Apertural view; ×107
5. *Truncorotaloides topilensis* (Cushman)
   a, Umbilical view; b, spiral view; c, Apertural view; ×80
6. *Truncorotaloides rohri* Brönnimann and Bermudez
   a, umbilical view; b, spiral view; c, Apertural view; ×93

PLATE II

1. *Truncorotaloides rohri* Bronnimann and Bermúdez
   a, spiral view; b, umbilical view; c, Apertural view; ×85
2. *Turborotalia centralis* Bermudez
   a, umbilical view; b, spiral view; c, apertural view; ×76
3. *Globorotalia broedermanni* (Cushman and Bermudez)
   a, spiral view; b, umbilical view; c, Apertural view; ×89
4. *Inordinatosphaera indica* Mohan and Soodan; ×79
5. *Turborotalia centalis* Bermudez
   a, spiral view; b, umbilical view; c, Apertrral viral ×85