

## MIOCENE FORAMINIFERA FROM THE BARIPADA BEDS-PART I, MAYURBHANJ DISTRICT, ORISSA

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### ABSTRACT

The paper records seventeen species of foraminifera from the arenaceous yellowish white fossiliferous limestone and greenish grey shales of the Baripada Beds. Three species and one subspecies are described as new. The present foraminiferal assemblage suggests an Early Miocene age to the arenaceous yellowish white fossiliferous limestone and a middle part of Early Miocene to Late Miocene age to the greenish grey shales. These beds were deposited in the shallower part of the inner neritic environment.

### INTRODUCTION

The present study is based on the rock sample collected from the Baripada Beds in the year 1970. The Baripada Beds are exposed in the river section situated at Itamundia (21° 53' N. : 86° 44' E.) village (see Fig. 1) and have a low easterly dip. The following geological sequence of the Baripada Beds has been recorded in this river section:

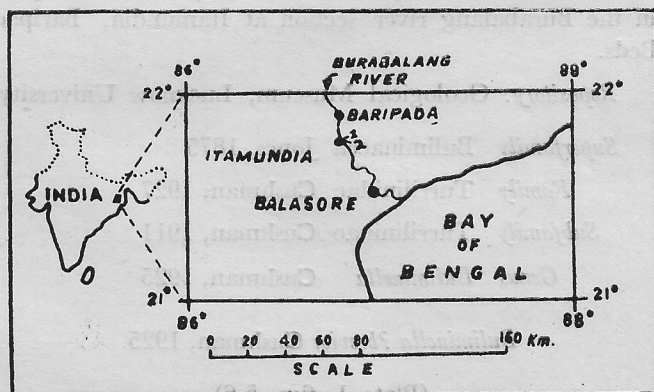


Fig. 1: Showing location of the area studied.

Lithological Units	Sample Numbers	Thickness in Metres
Laterite .. .. .	.. .. .	4.5
Conglomerate .. .. .	.. .. .	1.5
Greenish grey shales .. .. .	2	6
Arenaceous yellowish white fossiliferous limestone containing megafossils— <i>Ostrea</i> sp. etc.	1	1.2
Greenish white shales .. .. .	.. .. .	Not determined

The arenaceous yellowish white fossiliferous limestone contains microvertebrate and mollusca in abundance

but it is poor in smaller foraminifera and the conformably overlying greenish grey shales has yielded a rich assemblage of the smaller foraminifera. Frequency distribution of smaller foraminifera has been shown in Fig. 2.

SPECIES	SAMPLE NO.	
	1	2
AMMONIA BECCARI (LIHNE) VAR. KOEBOEENSLE ROY	C	C
BRIZALINA SINGH SP. NOV.		R
BULIMINELLA ?BREVIOR CUSHMAN		R
BULIMINELLA AFF. B. LONGICAMERATA BANDY		VR
BULIMINELLA ?HANZAWAI ASANO		R
CIBICIDES HAZARDI TEWARI SUBSP. NOV.		R
CRIBROELPHIDIUM SUBINCERTUM (ASANO)		R
CRIBRONONION DATTAI SP. NOV.		R
FLORILUS COMMUNIS (D'ORBIGNY)		R
LAGENA AMPHORA REUSS		VR
LAGENA SP.		VR
TRILOCULINA SP.		VR
TURBOROTALIA CONTINUOSA BLOW		VR
TURBOROTALIA OBESA (BOLLI)		VR
UVIGERINA SP.		VR
VALVULINERIA SASTRI SP. NOV.		R
?VIRGULOPSIS SP.		VR

LEGEND  
One specimen per sample :- Very rare = VR  
2-5 specimens per sample :- Rare = R  
6-10 specimens per sample :- Common = C

Fig. 2: Showing frequency distribution of foraminifera in the Baripada Beds, exposed in the Burabalang river section at Itamundia.

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## PREVIOUS WORK

The Baripada Beds were first recognised by Bose (1904) and subsequently, the geological and palaeontological studies on these beds were carried out by Pilgrim (1904), Eames (1936), Jena (1942), Hora (1939), Sharma (1956, 1957) and Sahni, Mehrotra and Jauhari (1971).

## SYSTEMATIC DESCRIPTION

*Order* FORAMINIFERIDA Eichwald, 1830

*Suborder* MILIOLINA Delage & Herouard, 1896

*Superfamily* MILIOLACEA Ehrenberg, 1839

*Family* MILIOLIDAE Ehrenberg, 1839

*Subfamily* QUINQUELOCULININAE Cushman, 1917.

*Genus* TRILOCULINA d' Orbigny, 1826

*Triloculina* sp.

(Plate 1 figs. 1-2)

*Description*: Test oval in side view, about 1/5 times as long as broad, periphery rounded, basal end more or less rounded, apertural end without neck; chambers distinct, inflated, three chambers making up the exterior region, middle one highly inflated and large in size; sutures distinct, depressed, concave in shape; wall smooth; aperture rounded, with indistinct lip and a long tooth tapering in width towards outer end.

*Dimensions*:

Specimen No.	Length	Breadth	Thickness
I/B/1	0.49 mm.	0.40 mm.	0.35 mm.

*Remarks*: Only a single fairly preserved specimen is obtained from the sample.

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia village, Baripada beds.

*Repository*: Geological Museum, Lucknow University.

*Suborder* Rotaliina Delage and Herouard, 1896

*Superfamily* Nodosariacea Ehrenberg, 1838

*Family* Nodosariidae Ehrenberg, 1838

*Subfamily* Nodosariinae Ehrenberg, 1838

*Genus* *Lagena* Walker and Jacob in Kanmacher, 1798.

*Lagena amphora* Reuss, 1863

(Plate 1, fig. 3)

*Lagena amphora* Reuss, 1863, pl. 4, fig. 57.

*Dimensions*:

Specimen No.	Length	Breadth
Hypotype No. I/B/2	0.35 mm.	0.15 mm.

*Remarks*: The type species has been recorded from the Oligocene Formation of Germany.

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository*: Geological Museum, Lucknow University.

*Lagena* sp.

(Plate 1, fig. 4)

*Description*: Test flask-shaped, inflated, broadest below the middle, basal end rounded, apical end with small neck; wall hispid; aperture rounded at the end of neck.

*Dimensions*:

Specimen No.	Length	Breadth
I/B/3	0.35 mm.	0.15 mm.

*Remarks*: Only a solitary specimen of the present form has been found.

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository*: Geological Museum, Lucknow University.

*Superfamily* Buliminacea Jones, 1875

*Family* Turriliniidae Cushman, 1927

*Subfamily* Turriliniinae Cushman, 1911

*Genus* *Buliminella* Cushman, 1925

*Buliminella ?brevior* Cushman, 1925

(Plate 1, figs. 5-6)

*Buliminella brevior* Cushman, 1925, pl. 5, fig. 14.

*Dimensions*:

Specimen No.	Length	Breadth
Hypotype No. I/B/4	0.35 mm.	0.18 mm.
Hypotype No. I/B/5	0.35 mm.	0.28 mm.

*Remarks*: The present form has smaller dimensions in comparison to the type form, reported from the Monterey shales (Miocene) of San Luis Obispo County, California, U.S.A.

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository*: Geological Museum, Lucknow University.

*Buliminella phanzawai* Asano, 1949

(Plate 1, fig. 7)

*Buliminella hanzawa* Asano, 1949, tf. 1 (54-55).*Dimensions:*

Specimen No.	Length	Breadth
Hypotype No. I/B 6	0.34 m.	0.18 m.

*Remarks:* The reported form is identical to the type species reported from the Kokozura Formation (Miocene), Japan. However, it has smaller dimensions in comparison to the type species.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

*Buliminella* aff. *Buliminella longicamerata* Bandy 1949

(Plate 1, figs. 8-9)

*Buliminella longicamerata* Bandy, 1949, pl. 26, fig. 8.*Dimensions:*

Specimen No.	Length	Breadth
I/B/7	0.38 mm.	0.18 mm.

*Remarks:* It seems very close in shape to *Buliminella longicamerata* Bandy recorded from upper part of the Jackson Formation, Zone B (Upper Eocene) of Clarke Country, Alabama, U.S.A. but differs from the latter in having smaller dimensions and a tooth in the middle of the aperture.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

*Family* Bolivinitidae Cushman, 1927

*Genus* *Brizalina* Costa, 1856

*Brizalina singhi* sp. nov.

(Plate 1, figs. 11-15)

*Description:* Test elongated in side views compressed, length about double of the width, tapering at the basal end, and broader at the apical end; chambers distinct, biserially arranged, varying in number from 9 to 11; sutures distinct and curved; wall smooth, perforated; aperture rectangular in shape with distinct narrow lip and a narrow median tooth.

*Dimensions:*

Specimen No.	Length	Breadth	Thickness
Holotype No. I/B/8	0.41 mm.	0.23 mm.	0.20 mm.
Paratype No. I/B/9	0.35 mm.	0.21 mm.	0.16 mm.

*Remarks:* *Brizalina singhi* sp. nov. is close to *Brizalina fujimongoi* (Ujiie) described from the Akahira Group, Tomita Formation (Miocene) of Japan, but differs from the latter in having a rectangular aperture with a narrow median tooth.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

*Family* Buliminidae Jones, 1875

*Subfamily* Bulimininae Jones, 1875

*Genus* *Virgulopsis* Finlay, 1939

? *Virgulopsis* sp.

(Plate 1, fig. 10)

*Description:* Test fusiform in side view, length slightly more than double of the width, apical end broad and rounded basal end pointed; chambers more or less distinct initial part of the test probably triserial and the rest being biserial; chambers gradually increase in size from basal end to apical end, slightly inflated; sutures indistinct towards the basal region, oblique and curved; aperture loop shaped, small in size.

*Dimensions:*

Specimen No.	Length	Breadth
I/B/10	0.35 mm.	0.20 mm.

*Remarks:* This form has characters similar to the genus *Virgulopsis* reported from the Middle Miocene. However, due to the scarcity of the specimens, no detail work on this disputed genus could be done.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

*Family* Uvigerinidae Haeckel, 1894

*Genus* *Uvigerina* d'Orbigny, 1826

*Uvigerina* sp.

(Plate 3, figs. 7-8, 10)

*Description:* Test elongate, somewhat cylindrical, length about triple of the breadth, widest at below the middle, apical end terminates into a very small neck,

basal end more or less pointed; chambers distinct, bigger towards the apical end and smaller towards the basal end, slightly inflated, triserial; sutures distinct, slightly depressed; wall smooth, perforated; aperture terminal, rounded with small non-perforate neck with narrow lip.

*Dimensions:*

Specimen No.	Length	Width
I/B/11	0.36 mm.	0.15 mm.

*Remarks:* Only a single specimen of the present form has been found.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

<i>Superfamily</i>	Discorbacea Ehrenberg, 1838
<i>Family</i>	Discorbidae Ehrenberg, 1838
<i>Subfamily</i>	Baggininae Cushman, 1927
<i>Genus</i>	<i>Valulineria</i> Cushman, 1926

*Valulineria sastri* sp. nov.

(Plate 2, figs. 1-6)

*Description.* Test medium, rounded, trochospiral, periphery broadly rounded, dorsal side having more than two whorls, ventral side umbilicate, moderately convex, showing the chambers of last whorl only; chambers distinct, slightly inflated, twelve chambers in the dorsal side, peripheral chambers somewhat subrectangular in shape while inner ones triangular in shape, six chambers in the ventral side, triangular in shape; sutures distinct, raised, curved in the dorsal side and radial limbate in the ventral side; wall smooth, perforated; aperture extra-umbilical with distinct lip.

*Dimensions:*

Specimen No.	Length	Breadth	Thickness
Holotype No. I/B/12 ..	0.30 mm.	0.25 mm.	0.18 mm.
Paratype No. I/B/13 ..	0.42 mm.	0.35 mm.	0.22 mm.
Paratype No. I/B/14 ..	0.40 mm.	0.35 mm.	0.21 mm.
Paratype No. I/B/15 ..	0.38 mm.	0.31 mm.	0.25 mm.
Paratype No. I/B/16 ..	0.43 mm.	0.35 mm.	0.28 mm.

*Remarks:* The present new species differs from *Valulineria californica* Cushman recorded from the Upper Monterey Formation (Miocene) of California in possessing less number of chambers in the last whorl, and smaller dimensions.

*Etymology:* The species is named after Mr. V. V. Sastri, Additional Director, Institute of Petroleum Ex-

ploration, Oil and Natural Gas Commission, Dehra Dun.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamendia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

<i>Superfamily</i>	Rotaliacea Ehrenberg, 1839
<i>Family</i>	Rotaliidae Ehrenberg, 1839
<i>Subfamily</i>	Rotaliinae Ehrenberg, 1839
<i>Genus</i>	<i>Ammonia</i> Brunnich, 1772

*Ammonia beccari* (Linne) var. *koebaeensis* (Le Roy), 1939

(Plate 2, figs. 7-9)

*Rotalia beccari* (Linne) var. *koebaeensis* (Le Roy), 1939, pl. 6, figs. 13-15.

*Dimensions:*

	Length	Breadth	Thickness
Hypotype No. I/B/17	0.55 mm.	0.49 mm.	0.35 mm.
Hypotype No. I/B/18	0.57 mm.	0.50 mm.	0.38 mm.
Hypotype No. I/B/19	0.68 mm.	0.58 mm.	0.40 mm.
Hypotype No. I/B/20	0.55 mm.	0.49 mm.	0.35 mm.

*Remarks:* The present form is smaller in dimensions than the type variety described from the Miocene transitional zone, Sand Clay Series of the Central Sumatra, Netherlands, Indies.

*Horizon and locality:* Arenaceous yellowish white fossiliferous limestone and greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological Museum, Lucknow University.

<i>Family</i>	Elphidiidae Galloway, 1933
<i>Subfamily</i>	Elphidiinae Galloway, 1933
<i>Genus</i>	<i>Criboelphidium</i> Cushman and Bronnimann,

*Criboelphidium subincertum* (Asano), 1950

(Plate 3, figs. 1-2)

*Elphidium subincertum* Asano. 1950. text figs. 56-57.

*Dimensions:*

Specimen Nos.	Length	Breadth	Thickness
Hypotype No. I/B/21	0.28 mm.	0.20 mm.	0.10 mm.
Hypotype No. I/B/22	0.28 mm.	0.24 mm.	0.12 mm.

*Remarks:* This species was originally described by Asano (*op. cit.*) from the Upper Pliocene, Senta Formation of Hokkaido Island, Japan.

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository*: Geological Museum, Lucknow University.

*Genus* *Cribrononion* Thalman, 1947

*Cribrononion dattai* sp. nov.

(Plate 3, figs. 3-6)

*Description*: Test medium in size, rounded, planispiral, involute, bilaterally symmetrical, inflated, periphery rounded umbilical region raised and perforated, lanceolate in edge view, length slightly larger than breadth; chambers distinct, slightly inflated eleven to twelve in number, elongate triangular in shape, pustulated chamber just below the apertural face, gradually increasing in size; sutures distinct, depressed, curved, radial, retral process absent, every suture contains a row of pores; wall smooth, perforated; aperture slightly indistinct, a row of pores at the base of apertural face.

*Dimensions*:

Specimen No.	Length	Breadth	Thickness
Holotype No. I/B/23	0.48 mm.	0.42 mm.	0.25 mm.
Paratype No. I/B/24	0.40 mm.	0.35 mm.	0.17 mm.
Paratype No. I/B/25 ..	0.52 mm.	0.45 mm.	0.25 mm.
Paratype No. I/B/26	0.45 mm.	0.40 mm.	0.22 mm.

*Remarks*: The present new species resembles *Cribrononion clarum* (Krashennikov) reported from the Miocene (Upper Tortonian) Formation of Podolia, U.S.S.R. in outline but differs from it in the presence of pustulose chamber just below the apertural face and aperture in the form of a row of pores at the base of apertural face.

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Etymology*: The species is named after Dr. A. K. Datta, Senior Scientific Officer, Institute of the Petroleum Exploration, Oil and Natural Gas Commission, Dehra Dun.

*Repository*: Geological Museum, Lucknow University.

*Superfamily* Glorigerinacea Carpenter, Parker & Jones, 1862

*Family* Globorotaliidae Cushman, 1927

*Subfamily* Globorotaliinae Cushman, 1927

*Genus* *Turborotalia* Cushman & Bermudez, 1949

*Turborotalia obesa* (Bolli) 1957

(Plate 3, figs. 9, 11-12 )

*Globorotalia obesa* Bolli, 1957, pl. 29, fig. 2 a—c, 3.

*Geoborotalia* (*Turborotalia*) *obesa* Bolli, Blow, 1959, pl. 19 fig. 124 a, fig. 124 a—c.

*Dimensions*:

Specimen No.	Length	Breadth	Thickness
Hypotype No. I/B/27	0.20 mm.	0.17 mm.	0.10 mm.

*Remarks*: Bolli (1957) has recorded the type species from the upper most part of the Cipero Formation (Miocene, *Globorotalia fohsi robusta* Zone) and *Globorotalia fohsi fohsi* Zone). Blow (1967) re-studied the present species and gave its new range from Zone N2 to Zone N23 (Late Oligocene to Pleisto-Holocene).

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository*: Geological Museum, Lucknow University.

*Turborotalia continuosa* Blow, 1959

(Plate 4, figs. 1-5)

*Globorotalia opima* Bolli subsp. *continuosa* Blow, 1959, pl. 19, figs. 125 a—c.

*Globorotalia* (*Turborotalia*) *continuosa* Blow, 1967, pl. 3, figs. 4-6.

*Dimensions*:

Specimen No.	Length	Breadth	Thickness
Hypotype No. I/B/28	0.20 mm.	0.15 mm.	0.10 mm.
Hypotype No. I/B/29	0.20 mm.	0.15 mm.	0.10 mm.

*Remarks*: It is similar to the type species *Turborotalia continuosa* Blow described from the Pozon Formation (Miocene, Vindobonian, Husito marly clay member). Blow (1967) re-studied the type species and recorded its range from Zone N6 to ?Zone N17 (Middle part of Early Miocene to Late Miocene).

*Horizon and locality*: Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository*: Geological Museum, Lucknow University.

*Superfamily* Orbitoidacea Schwager, 1876

*Family* Cibicididae Cushman, 1927

*Subfamily* Cibicidinae Cushman, 1927

*Genus* *Cibicides* de Montfort, 1908

*Cibicides hazzardi* Ellis, 1939

*Cibicides hazzardi tewarii* subsp. nov.

(Plate 4, figs. 7-9)

*Description:* Test medium, more or less plano-convex, periphery rounded, with prominent keel. dorsal side nearly flat, ventral side convex, with prominent umbo, showing the chambers of last whorl only; chambers distinct, gradually increasing in size, slightly inflated, twelve chambers in the dorsal side, chambers triangular to subrectangular in shape, ten chambers in ventral side, triangular in shape; suture distinct, raised, curved and limbate; wall smooth; aperture an arched slit at the base of the last formed chamber, with a distinct lip.

*Dimensions:*

Specimen No.	Length	Breadth	Thickness
Holotype No. I/B/31	0.31 mm.	0.25 mm.	0.10 mm.

*Remarks:* The present form resembles *Cibicides hazzardi* Ellis in certain morphological characters but differs from it in having a well developed keel.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Etymology:* The subspecies is named after Dr. B. S. Tewari, Professor, Geology Department, Panjab University, Chandigarh.

*Repository:* Geological Museum, Lucknow University.

*Superfamily* Cassidulinacea d'Orbigny, 1839

*Family* Nonionidae Schultze, 1854

*Subfamily* Nonioninae Schultze, 1854

*Genus* *Florilus* de Montfort, 1808

*Florilus communis* (d'Orbigny), 1846

(Plate 4, figs. 6, 10)

*Nonionina communis* d'Orbigny, 1846, pl. 5, figs. 7, 8.

*Nonion commune* (d'Orbigny), Cushman, 1939, pl. 3, fig. 2.

*Florilus communis* (d'Orbigny) Todd and Low, 1970, pl. 9, fig. 2.

*Dimensions:*

Specimen No.	Length	Breadth	Thickness
Hypotype No. O/B 31	0.31 mm.	0.25 mm.	0.10 mm.

*Remarks:* The type species has been described by d'Orbigny (1846) from the Miocene of Nussdorf in the Vienna Basin of Austria. Todd and Low (1970) also

reported it from the Miocene Formation of Midway drill holes, U.S.A.

*Horizon and locality:* Greenish grey shales, exposed in the Burabalang river section at Itamundia, Baripada Beds.

*Repository:* Geological museum, Lucknow University.

## CONCLUSIONS

1. On the basis of the present foraminiferal assemblage, the greenish grey shales of the Baripada Beds may be referred to a Middle part of Early Miocene to Late Miocene age and an Early Miocene age may be assigned to the conformably underlying arenaceous yellowish white fossiliferous limestone.

2. There is a high percentage of benthonic forms, which are of calcareous nature.

3. Only two planktonic species of the foraminifera are present.

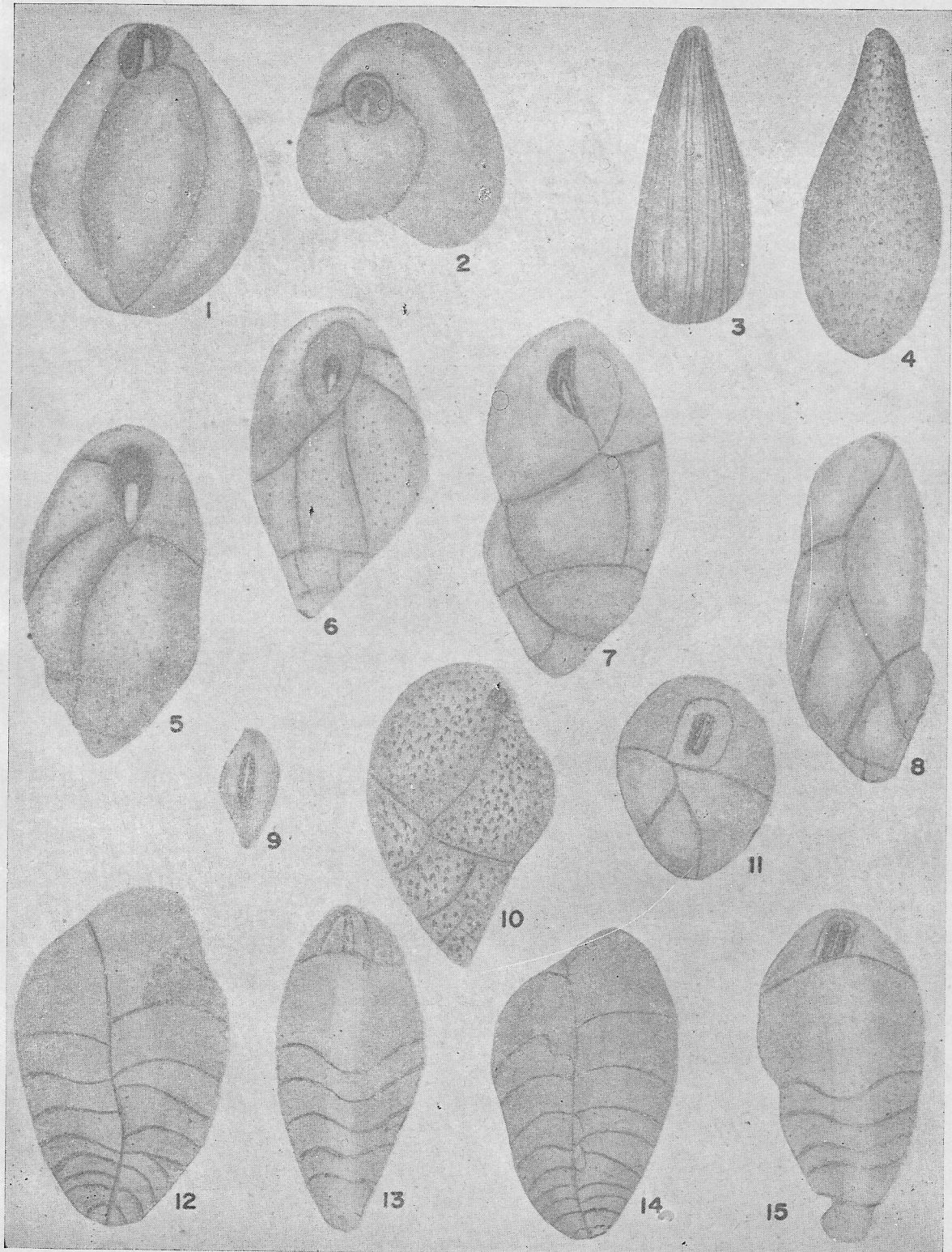
4. The foraminiferal assemblage suggests that the arenaceous yellowish white fossiliferous limestone and greenish grey shales of the Baripada Beds were deposited in the shallower part of the inner neritic environment.

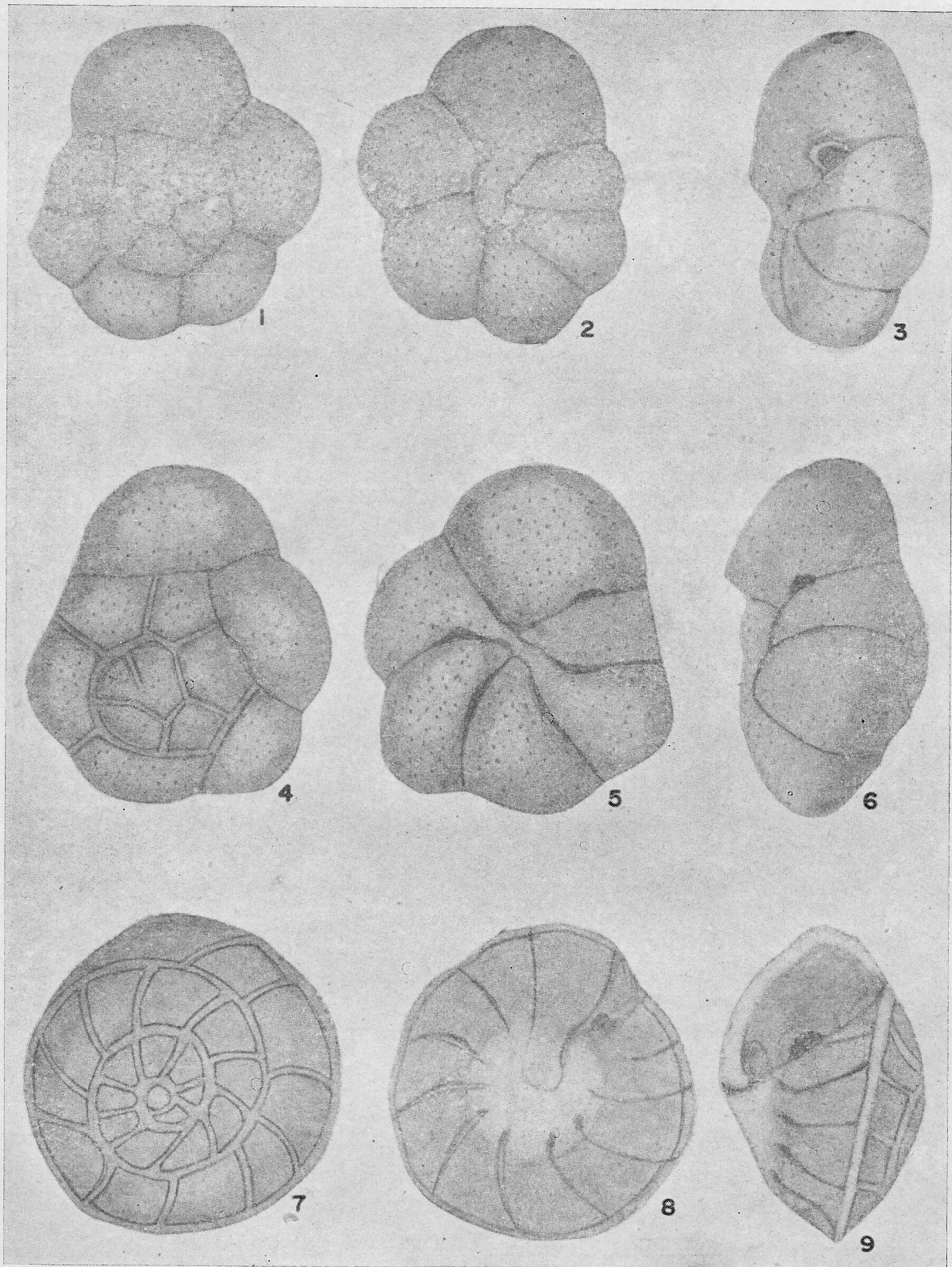
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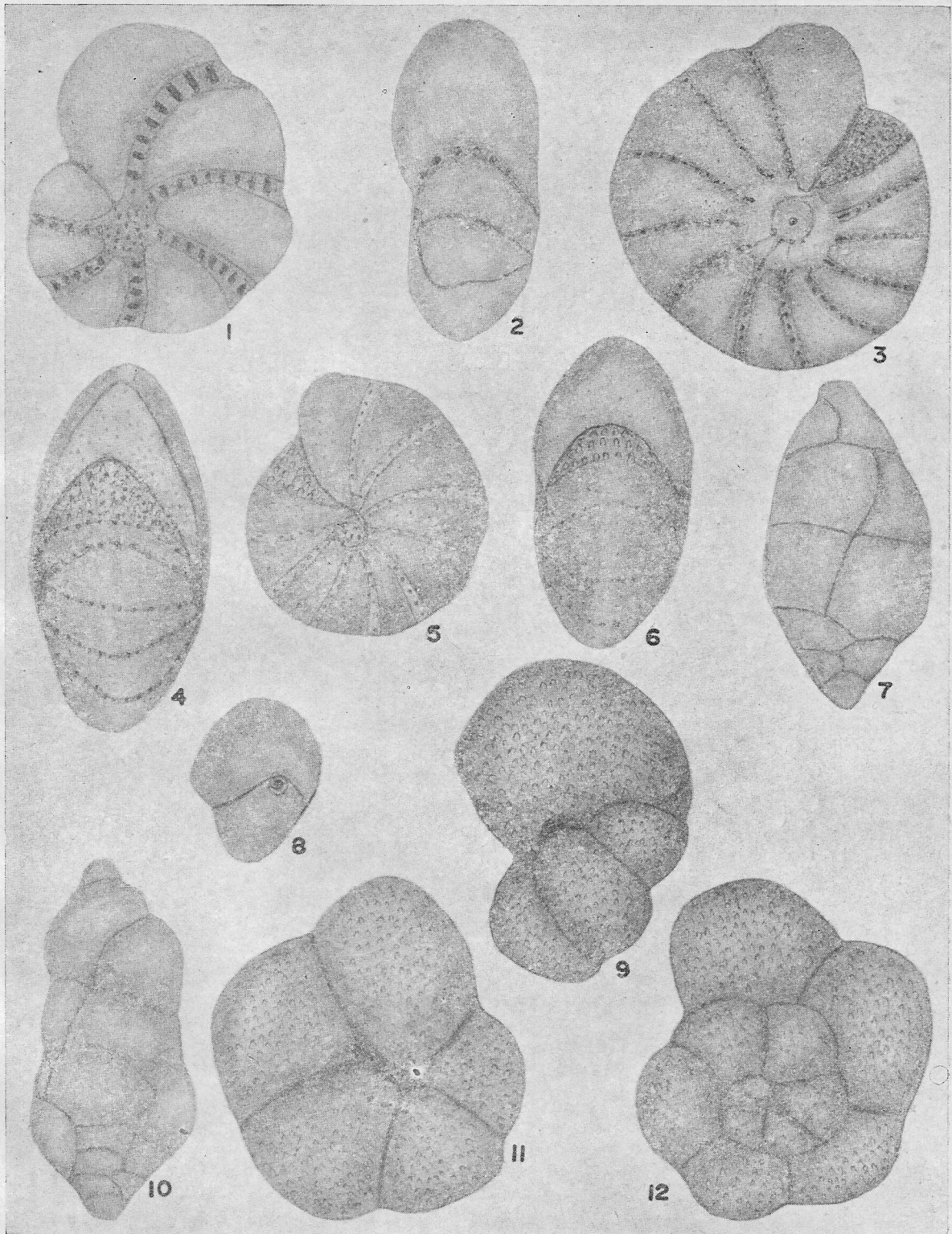
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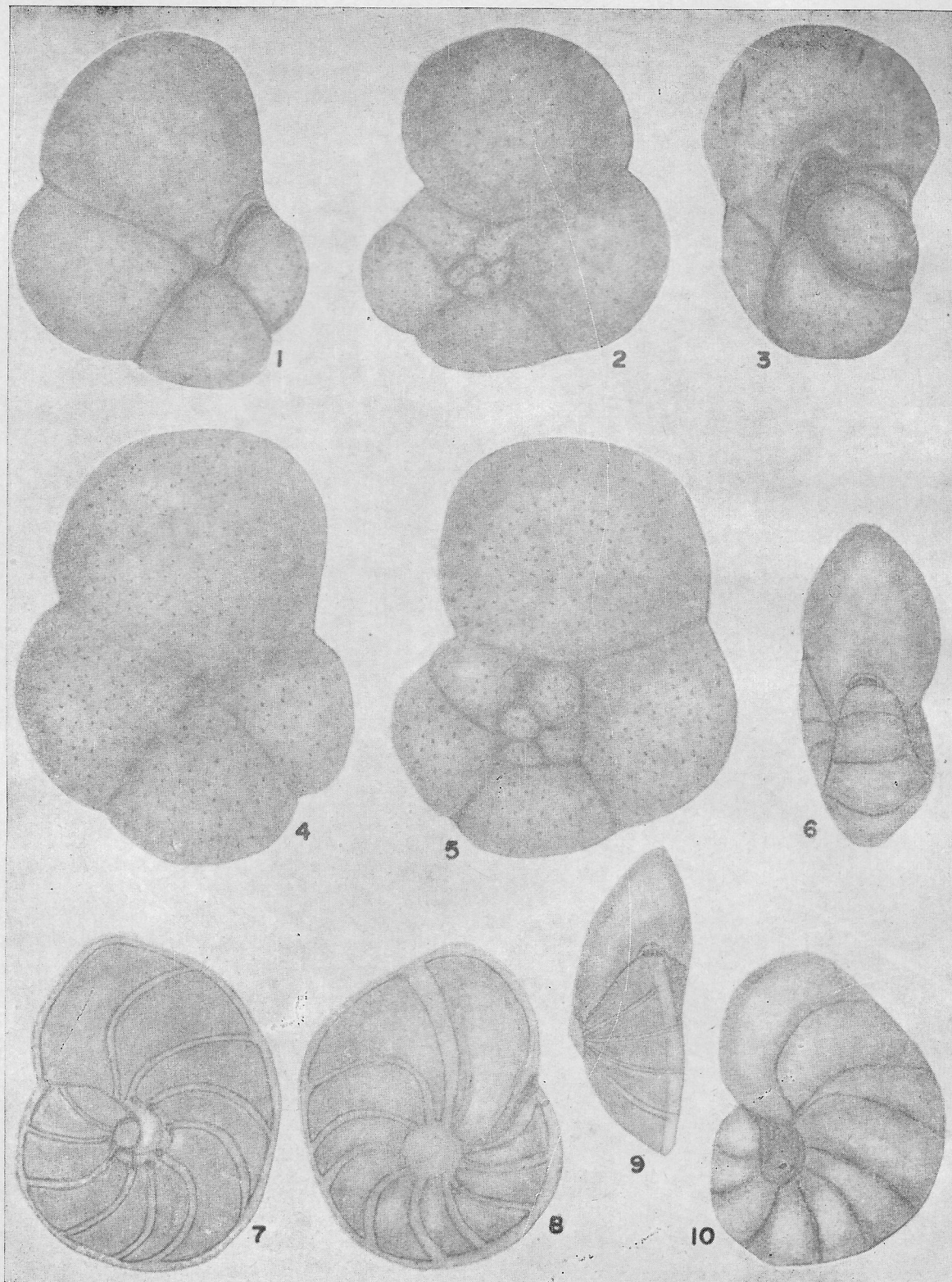
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## EXPLANATION OF PLATES

## PLATE 1

- 1-2 *Triloculina* sp., 1, side view; 2, apertural view;  $\times 100$ .
- 3 *Lagena amphora* Reuss, side view;  $\times 140$
- 4 *Lagena* sp., side view;  $\times 154$
- 5-6 *Buliminella pbrevior* Cushman, 5, apertural view;  $\times 137$ ; 6, apertural view;  $\times 146$ .
- 7 *Buliminella hanzawai* Asano, apertural view;  $\times 176$ .
- 8-9 *Buliminella* aff. *Buliminella longicamerata* Bandy, 8, side view; 9, apertural view;  $\times 153$ .
- 10 *Virgulopsis* sp., apertural view;  $\times 143$ .
- 11-15 *Brizalina singhii* sp. nov., 11, apertural view of the holotype;  $\times 137$ ; 12, side view of the paratype; 13, apertural view of the paratype;  $\times 137$ ; 14, side view of the holotype; 15, apertural view of the holotype;  $\times 157$ .

## PLATE 2

- 1-6 *Valvulineria sastrii* sp. nov., 1, dorsal view of the holotype; 2, ventral view of the holotype; 3, apertural view of the holotype;  $\times 173$ ; 4, dorsal view of the paratype; 5, ventral view of the paratype; 6, apertural view of the paratype;  $\times 136$ .
- 7-9 *Ammonia beccari* (Linne) var. *koeboeensis* (Le Roy), 7, ventral view; 8, ventral view, 9, apertural view;

## PLATE 3

- 1-2 *Criboelphidium subincertum* (Asano), 1, side view; 2, apertural view;  $\times 182$ .
- 3-6 *Cribrononion dattai* sp. nov., 3, side view of the holotype; 4, apertural view of the holotype;  $\times 142.5$ ; 5, side view of the paratype; 6, apertural view of the Paratype;  $\times 112$ .
- 7-8, 10 *Uoigerina* sp., 7, 10, side views; 8, apertural view;  $\times 153$ .
- 9, 11-12 *Turborotalia obesa* (Bolli), 9, apertural view; 11, umbilical view; 12, spiral view;  $\times 275$ .

## PLATE 4

- 1-5 *Turborotalia continuosa* Blow, 1, umbilical view; 2, spiral view; 3, apertural view;  $\times 290$ ; 4, umbilical view; 5, spiral view;  $\times 290$ .
- 6-10 *Florilus communis* (d Orbigny), 6, apertural view; 10, side view;  $\times 161$ .
- 7, 8-9 *Cibicides hazzardi tewarii* subsp. nov., 7, ventral view of the holotype; 8, dorsal view of the holotype; 9, apertural view of the holotype;  $\times 167$ .