

FORAMINIFERA AND AGE OF THE UPPER SURMA SEDIMENTS IN THE GARO HILLS

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ABSTRACT—The Upper Surma sediments in Bugi River Section of the Garo Hills, Assam are assigned an Upper Miocene (Sahelian) age, based on the contained foraminiferal assemblage. The Upper age limit of *Cassigerinella chipolensis*, established in Java in 1966, is modified. The age of the Surma Sediments, as inferred on the recent paleontological evidences in other parts of Assam is reviewed.

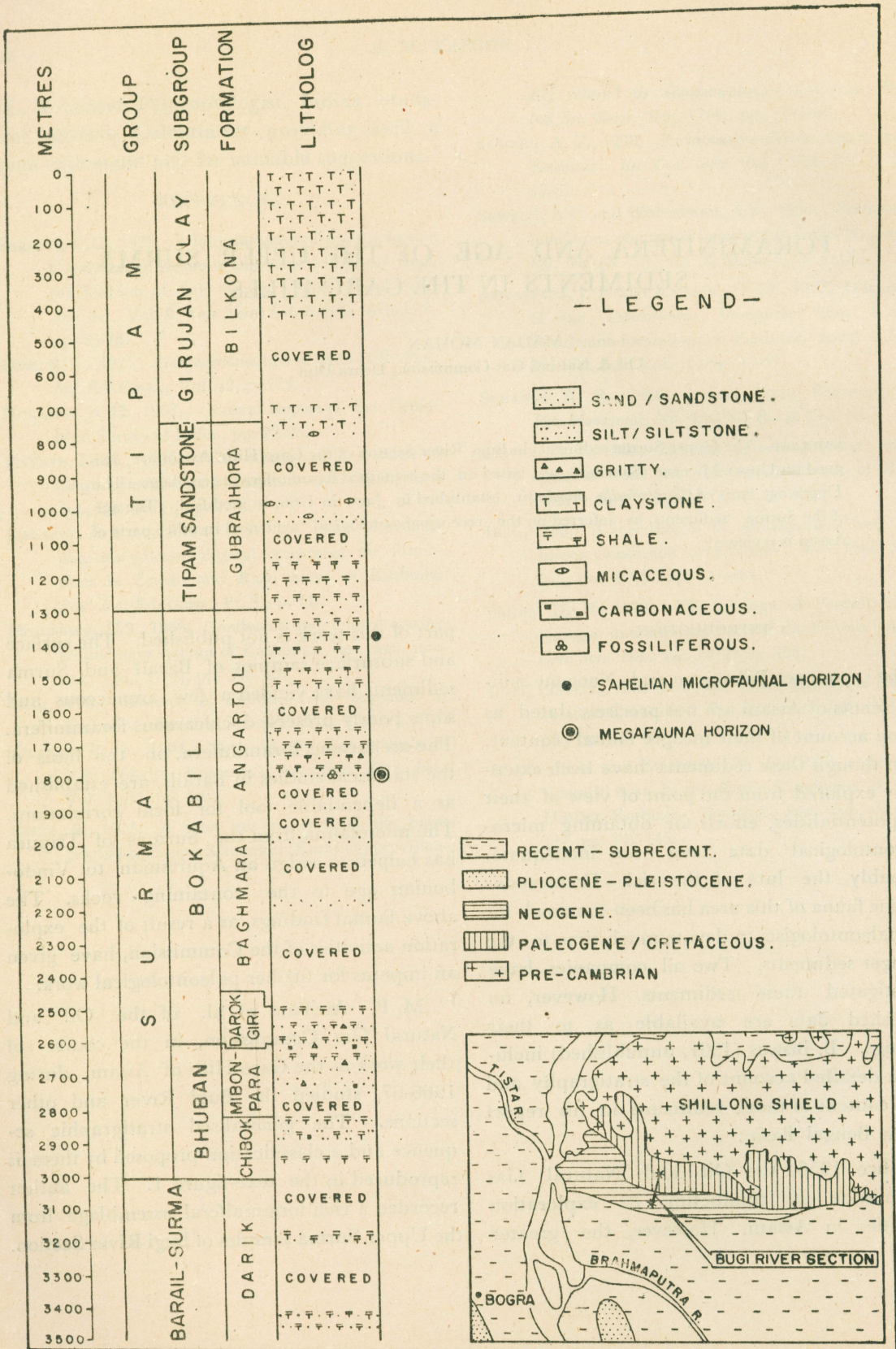
INTRODUCTION

The younger Paleogene and Neogene sediments of Assam are not precisely dated as yet on account of their meagre faunal content. Even though these sediments have been extensively explored from the point of view of their oil potentialities, efforts for obtaining micro-paleontological data have been inadequate. Probably the lure of the rich Cretaceous-Eocene fauna of this area has been too much for the paleontologists to devote much time to the younger sediments. Two oil companies have investigated these sediments. However, no published data are available as to their findings. B. Biswas (1961, unpublished) included a detailed account of the stratigraphy and fossil content of these sediments in his report on the Bengal Basin.

Since 1956, the Oil and Natural Gas Commission is conducting its exploration activities in Assam. However, the greater

part of this work is not published. The surface and subsurface samples of Barail and Surma sediments have yielded a few arenaceous and some poorly preserved calcareous foraminifera. The arenaceous foraminifera, on the basis of the statistical studies in Barails, are established as a dependable tool for local correlations. The microfauna from the Surmas of Tripura has helped to assign an Aquitanian to Vindobonian age to the containing rocks. The above faunal findings, as a result of the exploration activities of the Commission, have given an impetus for further paleontological work.

M. P. Asthana et. al. of the Oil and Natural Gas Commission, in the course of their work in the Garo Hills of Assam, during 1966-67, studied the Bugi River and other sections. The generalised stratigraphic sequence and a classification proposed by them is reproduced in the text-figure 1. The author recorded a rich foraminiferal assemblage from the Upper Surma samples of Bugi River Section.



TEXT FIG. I. STRATIGRAPHY ALONG BUGI RIVER SECTION.

(AFTER - M. P. ASTHANA, 1967).

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The views expressed in the paper are those of the author and not of the Oil and Natural Gas Commission.

PREVIOUS WORK

The Paleocene and Eocene sequences of Assam contain profuse microfauna which lend themselves well for age determinations. However, the same is not true of the Barail and younger sediments on account of their poor faunal contents. Hitherto, the dating of the greater part of the Tertiary sequence of Assam has been done by comparing the recognised unconformities with the well established unconformities in similar sediments of Burma. In addition, the sporadic megafaunal yield of some of the Surma sediments has also been taken into account.

Keeping in view the scope of the present paper, a brief review of the available paleontological data from the Barail and younger sediments is in order.

Pandey and Soodan (1968) conducted statistical studies on the arenaceous foraminiferal assemblage from the Barails of the Rudrasagar Oil Field of Upper Assam. They were able to obtain a well to well correlation of the Barails, as also some significant data regarding

the basin configuration and geometry of the oil bearing sands.

Mukherjee identified twelve species of the molluscan fauna from a sandy-mudstone near the top of Bhuban 'stage', from an exposure near Kanchanpur (4 miles WSW of Hailakundi, 24° 40' 30" N : 92° 33' 30" E) in Cachar district, and assigned a Lower Miocene (Aquitanian) age to the containing beds.

Soodan (1968) recorded *Globorotalia menardii*, *archaemenardii*, *Globorotalia foshi barisanensis*, *Globorotalia (Turborotalia) opima continuosa*, *Globorotalia birngeae*, *Globorotalia (Turborotalia) mayeri*, *Globigerina praebulloides*, *Globigerina falconensis*, *Cassigerinella chipolensis*, etc., and assigned a Lower Miocene to lower part of Upper Miocene (Upper Aquitanian to Lower Vindobonian) age to Upper Bhuban and Lower Bokabil sediments exposed in the Batehia anticline (24°-24° 10' N : 91° 50'-92° E) in Tripura State.

Pandey (1968) reported *Potamochoerus hysndricus*, *Stegolophodon latidens*, *Hipparian antelopinum* and *Hipparian theobaldi* from the pebble beds of Upper Bhuban and Lower Bokabil sediments, exposed in the vicinity of Hawabari (23° 48' 52" N : 91° 34' 31" E), Baldungwal (23° 48' 31" N : 91° 32' 04" E) and Nareng (28° 48' 38" N : 91° 31' 45" E) in Baramura area of Tripura. He assigned an Upper Miocene (Sahelian) age to these pebble beds.

Pinfold discovered two fossil localities—one just to the north of Dalu and the other at Bagmara—in the Garo Hills. Eames, Vredenburg and Mukherjee identified more than a hundred species, most of which are common to both the localities, belonging to Mollusca, Pisces, Reptilia and only one form of Foraminiferida—*Rotalia beccarii* (Linne'). The age assigned to these fossiliferous beds is Lower-Middle Miocene (Aquitanian-

Burdigalian)—a position between Kama and Pyalo faunas of Burma.

The author in the course of his examination of subsurface samples from a shallow well near Kalinagar (24°41' N : 92°32' E) in Cachar district, recovered a reasonably good assemblage of benthonic and planktonic foraminifera from the Surma sediments and assigned a Middle-Upper Miocene (Upper Burdigalian to Sahelian) age.

Excluding silicified wood and indeterminate vegetable remains, very few fossils have been reported from Tipam group of sediments. A new species of *Batissa*, closely related to *B. crawfurdi* occurring high in the Pegu System of Burma) was recovered from Tipam sandstones near the confluence of Bhugti and Dayang rivers in the Naga Hills. Near Karaibari (Mahendraganj—25°20' N : 89°55' E) several badly preserved marine and non-marine fossils are reported from a sequence of Tipam sandstones and clays. Pascoe (p. 1821) opines, that the marine (molluscan) fauna is likely to be of Bokabil age and non-indigenous, while the non-marine (vertebrate) fauna is indigenous and indicative of an Upper Miocene (Lower Tortonian) age.

The author has recovered a few arenaceous foraminifera including *Rhizammina*, *Bathysiphon* and *Saccorhiza* from the upper part of the Girujan Clays exposed in Bugi River Section. However, it is yet to be confirmed, whether, they are indigenous. Apart from this no fauna is reported from the Girujan clays.

The present work was conducted on the samples collected from Bugi River Section of Garo Hills, in the southern Shillong front. The author is not aware of any published report on the diagnostic microfauna from the Barail or younger sediments of this area. The work

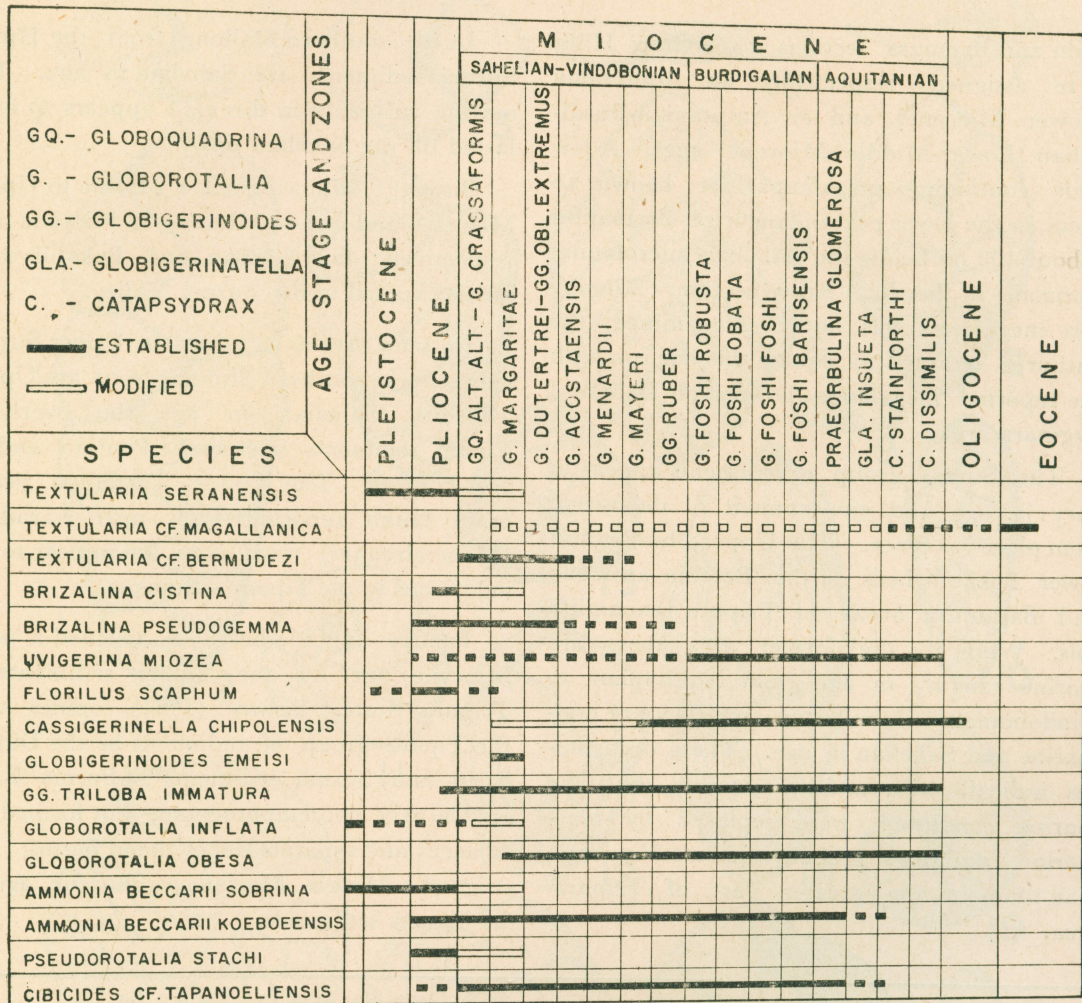
under report in addition to giving useful data for the age evaluation of the Surma sediments, has also served to modify the range of an important plankton—*Cassigerinella chipolensis*. These aspects are discussed in the succeeding pages.

MICROFAUNA

The microfauna recovered from the upper part of Angartoli Formation (Surma group ; Bokabil sub-group), exposed in Bugi River Section, is discussed and illustrated. The reference list for the microfauna is given at the end of the paper. The established stratigraphic ranges of the identified species, all the world over, are given in the text figure 2.

The planktonic forms, though rare, provide a good control for age evaluation. The arenaceous foraminifera and the abundant rotalids suggest for this area, shallow open marine to brackish water conditions, during upper Surma times.

Globigerinoides emeisi is known in Java to be restricted to the Upper Miocene (Sahelian) *Globorotalia margeritae* zone. *Globorotalia obesa* and *Globigerinoides triloba immatura* have long ranges extending up to the Upper Miocene and Lower Pliocene respectively. *Globorotalia inflata* commonly recorded from Recent sediments is also known to occur from Upper Miocene onwards. The assemblage of all the four planktons restricts the age of these sediments to Upper Miocene (Sahelian), preferably Sarmatian, equivalent in age to *Globorotalia margeritae* zone of Java. The established ranges of some of the associated benthonic foraminifera and an important plankton—*Cassigerinella chipolensis* have thus been suitably modified, in the light of the present evidence.



TEXT FIG. 2. ESTABLISHED STRATIGRAPHIC RANGES OF FORAMINIFERA RECORDED FROM UPPER MIOCENE SEDIMENTS IN GARO HILLS ASSAM.

Until recently the upper age limit of *Cassigerinella chipolensis* was established to be the top of Burdigalian. Bolli (1966) extended, on the basis of his findings in Java, this limit to Lower Vindobonian. However, the occurrence of this form with other well recognised forms has led the author to suggest the extension of the upper age limit of *Cassigerinella chipolensis* to the top of Miocene.

Cassigerinella chipolensis is recorded from many localities (Cambay, Kutch, Cauvery

basins, etc.) in India, but its extension into Upper Miocene beds was not known. The Middle-Upper Burdigalian age assigned on the evidence of *Cassigerinella chipolensis* and associated species of *Ammonia* have to be reviewed in the light of the present findings.

AGE OF SURMA SEDIMENTS

Based on the study of recovered mega-fauna, the upper part of the Bhuban sub-group of Kanchanpur and the Bokabil sub-group of

Dalu and Bagmara sections in the Garo Hills, were assigned, respectively, an Aquitanian (Lower Miocene) and an Aquitanian-Burdigalian (Lower-Middle Miocene) ages. A few beds containing megafauna are known to occur in the lower part of Angartoli Formation (about 400 m. below the Sahelian microfaunal horizon) in the Bugi River Section. Though this megafauna has not been examined, the author is tempted to equate this horizon with the reported megafauna horizon of Dalu and Bagmara areas.

The Surma group of sediments appear to vary in age and environment of deposition from place to place. The Upper Bhuban and lower Bokabil beds of the Batchia anticline and Baramura areas of Tripura exemplify this. While in the former area these are marine ranging in age from Aquitanian to Vindobonian, in the latter area they are non-marine and Sahelian in age. These occurrences indicate with a fair certainty that the marine conditions were replaced by non-marine conditions probably in late Vindobonian times in the greater part of Tripura area.

In the southern Shillong front the Upper Surma sediments are Sahelian in age. The marine influence in this area appears to have lasted till the Sahelian times.

Biswas (1961) assigned a Middle to Upper Miocene and a late Miocene to Pliocene age respectively, for Bhuban and Bokabil sediments exposed in the Surma Valley.

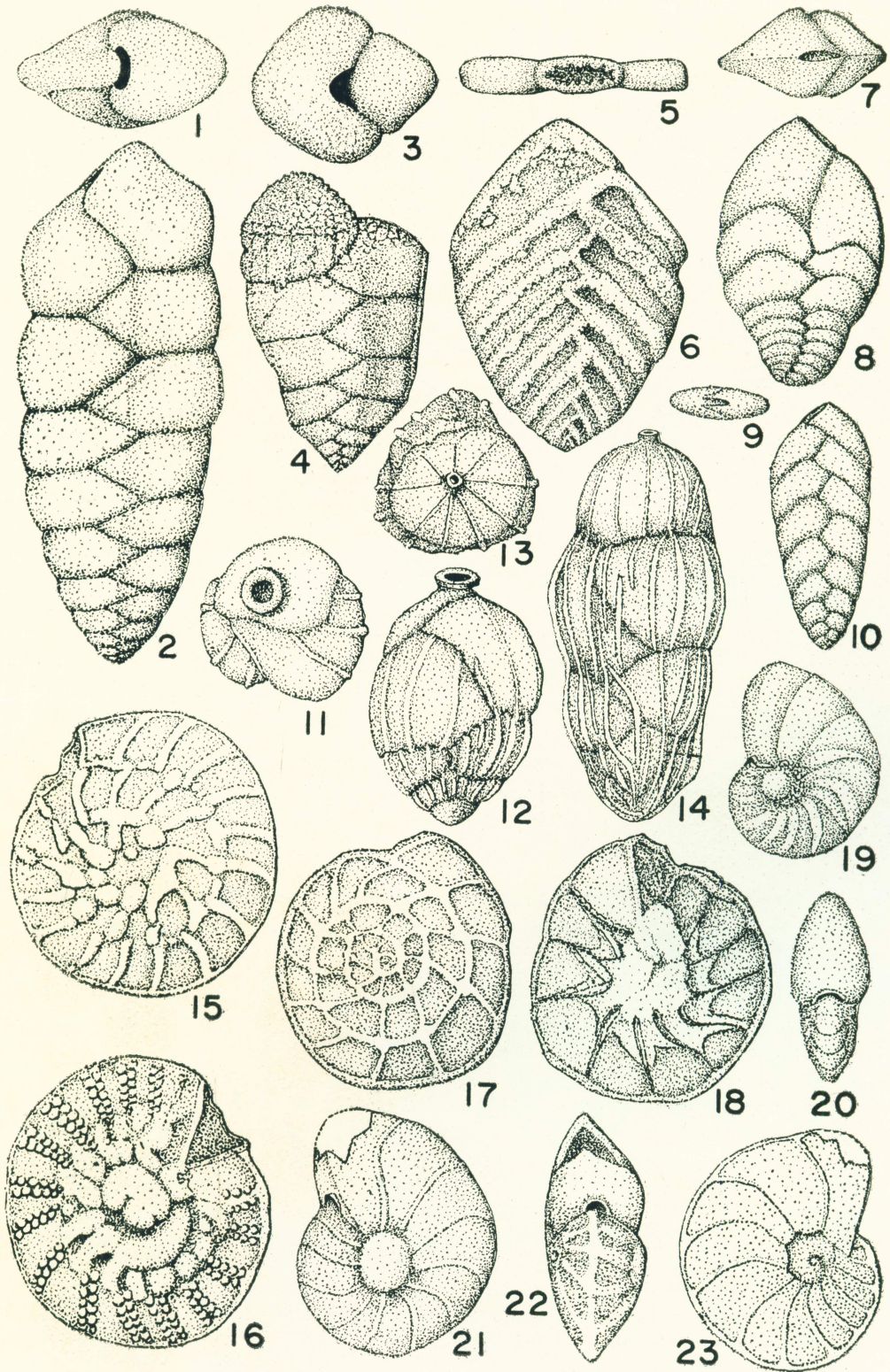
In view of the fact that the Upper Surma sediments in southern Shillong front are Upper Miocene (Sahelian) in age, the overlying Tipam sediments have to be Pontian and/or post-Pontian. The Lower Tortonian vertebrate fauna reported from near Karaibari (Mahendraganj) town does not appear to be indigenous to the Tipam sediments.

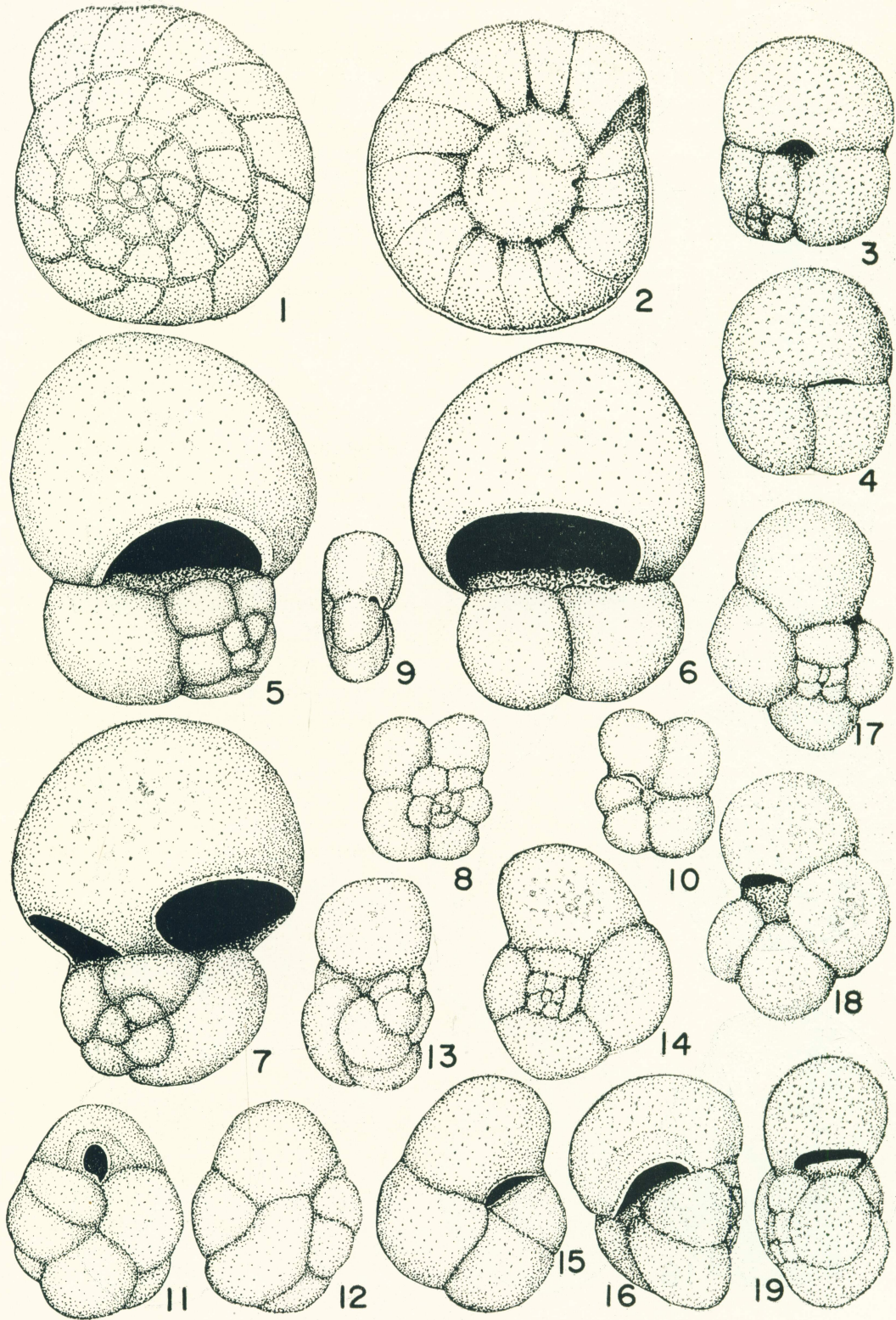
Pandey (1968) has also assigned a post-Miocene age for the Tipam sediments of Tripura State. Biswas (1961) opines that the Tipam group of sediments in the Dihing basin and Surma sediments of Surma Basin are largely contemporaneous, but formed in adjacent and separate depositional basins. He assigned a Middle Miocene to Pliocene age to the Tipam sediments.

EXPLANATION OF PLATE 3

- 1, 2. *Textularia seransis*. 1 : apertural view. 2 : side view x 100.
 3, 4. *Textularia magallanica*. 3 : apertural view. 4 : side view x 106.
 5, 6. *Textularia* cf. *bermudezi*. 5 : apertural view. 6 : side view x 73.
 7, 8. *Brizalina cystina*. 7 : apertural view. 8 : side view x 200.
 9, 10. *Brizalina pseudogenma*. 9 : apertural view. 10 : side view x 200.
 10, 14. *Eowigerina miozea*. 11, 12 : apertural and side view of a microspheric form. x-99. 13, 14 : apertural and side view of a megalospheric form. x 93.
 15, 16. *Pseudorotalia stachi*. 15 : dorsal view. 16 : umbilical view. x 48.
 17, 18. *Ammonia beccarii* var. *kobocensis*. 17 : dorsal view. 18 : umbilical view. x 48.
 19, 20. *Florilus scaphum*. 19 : side view. 20 : apertural view. x 92.
 21, 23. *Cibicides* cf. *tapanoeliensis*. 21 : ventral view. 22 : side view. 23 : dorsal view. x 105.

All figured specimens are from Upper Surma sediments, exposed in Bugi River Section, Garo Hills. They are deposited at the Paleontology laboratory, Oil & Natural Gas Commission.





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It is essential to examine more Surma sections for their microfaunal contents. The Sahelian microfaunal horizon may finally prove as a most significant Upper Miocene marker in the southern Shillong front and may help in resolving the age discrepancies of the Neogene Strata in this region.

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- Florilus scaphum* (Fichtel and Moll) = *Nautilus scapha* Fichtel and Moll, 1798—Fichtel

EXPLANATION OF PLATE 4

- 1, 2. *Ammonia beccarii* var. *sobrina*. 1 : dorsal view. 2 : ventral view. x 74.
 3, 4. *Globigerinoides triloba immatura*. 3 : spiral view. 4 : umbilical view. x 96,
 5, 7. *Globigerinoides emeisi*. 5 : spiral view. 6 : umbilical view. 7 : side view. x 96.
 8, 10. *Globigerina* sp., 8 : spiral view. 9 : side view. 10 : umbilical view. x 196.
 11, 13. *Cassigerinella chipolensis*. 11—12 : apertural and opposite view. 13 : side view. x 266.
 14, 16. *Globorotalia inflata*. 14 : spiral view. 15 : umbilical view. 16 : side view. x 96.
 17, 19. *Globorotalia obesa*. 17 : spiral view. 18 : umbilical view. 19 : side view. x 100.

All figured specimens are from Upper Surma sediments, exposed in Bugi River Section of Garo Hills. They are deposited at the Paleontology laboratory, Oil & Natural Gas Commission, India.

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