

ON THE STRATIGRAPHIC STATUS OF THE MATANOMADH FORMATION, KUTCH, INDIA

R. K. SAXENA

Birbal Sahni Institute of Palaeobotany, Lucknow-226007

ABSTRACT

The present paper deals with the litho-, bio- and chronostratigraphic status of the Matanomadh Formation, Kutch, India. Lithostratigraphically, this unit is given a formation status on the basis of its lithological peculiarities and mappability.

The study of the Matanomadh palynoflora provides sufficient data for establishing its biostratigraphic status. Four biozones have thus been recognized, viz., (i) basal—Barren Zone (ii) lower—*Dandotiaspora dilata* Cenozoone (iii) middle—*Couperipollis brevispinosus* Cenozoone and (iv) upper—Sponge Zone. The Barren Zone is equivalent to the Laterite Member while rest three zones correspond to the Clastic Member.

On the basis of the palynofossils recovered, the age of the Matanomadh Formation has been determined as Palaeocene. Since the Matanomadh sequence represents a specific time interval, i.e. Palaeocene Epoch, the chronostratigraphic status of this unit has been evaluated as series, i.e. Madh Series.

INTRODUCTION

AN observation of the stratigraphic sequence of Kutch reveals that the end of the Mesozoic Era had witnessed an extensive volcanic activity in this region. The erupted lava, after cooling and consolidation, formed the basaltic traps, named as Deccan Trap Formation. The traps form an undulating land surface over which the Tertiary rocks were laid down. The traps are generally overlain by the Matanomadh Formation which has a geographically wide distribution all along the southern contour margin of the traps.

The term Matanomadh Formation was introduced by Biswas and Raju (1971, 1973) for the basal lithostratigraphic unit of the Tertiary sequence of Kutch. The formation has been named after its type area Matanomadh (Lat. 23°32' 30"N: Long. 68°57'10" E) where it is best developed and exposed.

Lithologically, this formation is divisible into two members, viz., (i) Laterite Member and (ii) Clastic Member. The lower-Laterite Member is characterized by

pink, grey and variegated laterites and white-mottled kaolinitic clay. On the other hand, the upper-Clastic Member is made up of sandstones alternated by carbonaceous and tuffaceous shales, mottled clays, tuff, lignitic shales etc. The details of these members have already been published by Saxena (1977).

STRATIGRAPHIC STATUS

The earliest account on the geology of Kutch was published by Barnes (1834). He, however, could not identify the rocks belonging to the Matanomadh Formation as a separate stratigraphic unit and placed them under the unit "Sandstone with clay and coal". Wynne (1872) was the first to recognize these rocks as a full-fledged stratigraphic unit and named it as Subnummulitic Group because it conformably underlies a distinct sequence of *Nummulites* bearing rocks.

Mathur (1966) used the term Supratrappeans for this stratal succession because it overlies the Deccan Traps. Both these above mentioned terms (Subnummulitic Group and Supratrappeans) are informal, solely based upon the order of superposition, and do not follow the Code of Stratigraphic Nomenclature.

The term 'Ranikot' was used by Sastri, Mohan and Guha (1965) for this stratal unit, probably because it underlies the rock sequence containing characteristic foraminiferal fauna homotaxial to the Laki Series of Sind-Baluchistan.

Biswas (1965) and Biswas and Deshpande (1970) introduced the term Madh Series, which is a chronostratigraphic equivalent of the Matanomadh Formation.

Lately, Biswas and Raju (1971, 1973), for the first time recognized lithostratigraphic distinctiveness of this unit and established its formation status based on

certain lithological peculiarities and mappability. They formally named this sequence as Matanomadh Formation.

As a result of the detailed geological and palynological work carried out on this stratal unit by the author, its stratigraphic status in terms of litho-, bio- and chronostratigraphy, has been discussed ahead.

Lithostratigraphic Aspect — The definition of the term 'formation', as proposed in the Art. 7.00 of the Code of Stratigraphic Nomenclature of India (1971) is as follows:

"— The formation is the fundamental unit of lithostratigraphic classification characterized by a typical lithologic association and homogeneity. It is a mappable unit".

The necessary conditions for a formation, as prescribed by the Code of Stratigraphic Nomenclature implies that a formation must be (i) recognizable in the field by its lithologic association, (ii) mappable (on a scale of 1:50000 or 1:63360, *vide* Art. 7.04 CSNI) and (iii) delimited on its lower and upper boundaries by the planes of lithologic change which makes it a practicable unity of characters.

The Matanomadh Formation, as defined and mapped by Biswas and Raju (1971, 1973) and Saxena (1977) fulfills all the necessary requirements for a formation. This was also confirmed during the measurement of stratigraphic sections and mapping of the Matanomadh Formation in its type area. Thus strictly in lithostratigraphic sense the sequence described by Biswas and Raju is considered as 'formation'—the fundamental unit of lithostratigraphic classification. Besides, on the basis of lithological characters this formation has been formally divided into two members, viz., Laterite Member and Clastic Member. The detailed description of these members has been published by Saxena (1977).

Biostratigraphic Aspect — The lower-Laterite Member of the Matanomadh Formation is unfossiliferous and biostratigraphically constitutes a 'Barren Zone'. On the other hand, the upper-Clastic Member yielded rich microfloral assemblage which provides definite evidences for establishing its biostratigraphic status. An analysis of the palynological data, recovered from different

lithic units reveals that the entire sequence of the Clastic Member is divisible into three distinct biozones recognizable by the occurrence of a few restricted marker species together with the presence of some dominant species forming distinct assemblages.

The lower zone, i.e. *Dandotiaspora dilata* Cenozoone is characterized by the presence of *Dandotiaspora dilata*, *D. plicata*, *D. telonata*, *Todisporites major*, *Lygodiumsporites lakiensis*, *L. eocenicus* etc.

The middle zone, i.e. *Couperipollis brevispinosus* Cenozoone is characterized by the predominance and restricted occurrence of *Couperipollis brevispinosus*, *C. wodehousei*, *C. rarispinosus*, *C. robustus*, *Laricoidites punctatus*, *Araucariacites australis* etc.

The upper zone, i.e. Sponge Zone is devoid of spores and pollen grains but exclusively contains sponge spicules. As this zone laterally extends in almost all the sections in the type area, its value as a biostratigraphic marker becomes apparent.

Thus, in terms of biostratigraphy, the Matanomadh Formation may be called to be constituted by following four biozones in the ascending order:

4. Upper — Sponge Zone
3. Middle — *Couperipollis brevispinosus* Cenozoone

2. Lower — *Dandotiaspora dilata* Cenozoone

1. Basal — Barren Zone.

The detailed description of these biozones will be published later.

Chronostratigraphic Aspect — Recovery of palynofossils from the Matanomadh sequence and their usefulness in the age determination provide evidences for the chronostratigraphic evaluation of this succession. Biswas (1965) and Biswas and Deshpande (1970) instituted a chronostratigraphic classification of the Tertiary sediments of Kutch. They named the Matanomadh sequence as the 'Madh Series' and assigned a Palaeocene age. Biswas (*op.cit.* p. 3) states:

"The Madh Series overlies the Deccan Traps but underlies the Kakdi Stage which correlates well with the Lower Eocene Laki rocks. Thus, considering the order of superposition these rocks are assigned to the Palaeocene, while age of Deccan Traps in Kutch appears to be Upper Cretaceous to Palaeocene

In Sind-Baluchistan, Ranikot rocks lie over the Danian *Cardita beaumonti* Beds and underlie the Laki rocks. If the order of superposition of beds in both the areas are compared then the uppermost Cretaceous, *C. beaumonti* Beds, corresponds to Deccan Traps of Kutch and Lower Ranikot to the Madh Series."

The above statement makes it clear that the Palaeocene dating for the Matanomadh sequence by Biswas (1965) is based on the order of superposition without any fossil evidence in support of it. He, however, referred a few palynological fossils, viz., *Deltoidospora diaphana*, *Proteacidites palisadus*, *Ginkgo bilobaeformis*, *Schizaea penicillata* and *Verrunonacolpites brevicolpatus* recovered from the Madh Series by Y. K. Mathur of O.N.G.C. These fossils indicate a Palaeocene age.

The definition of the term 'Series', as proposed in the Art. 26.01 of the Code of Stratigraphic Nomenclature of India (1971) is as follows:

"The rocks of a series represent the specific interval of geologic time of the type section of strata for the series. Both the boundaries of this type section or reference section should be defined with precise stratigraphic boundaries".

According to Art. 24.00 of the Code of Stratigraphic Nomenclature of India (1971)

the rank series is equivalent to the epoch of the geologic time units.

The Matanomadh sequence, which Biswas (1965) and Biswas and Deshpande (1970) named as Madh Series, is Palaeocene in age.

A detailed palynological analysis of the Matanomadh sediments carried out by the author confirms its Palaeocene age. The details of the palynological assemblage and its utilization in age determination will be published elsewhere.

Since the type section of the Madh Series, i.e. Matanomadh, represents a specific time interval (Palaeocene Epoch) and is defined by precise stratigraphic boundaries, the series status for this sequence seems to be justified.

CONCLUSION

From the foregoing discussion about the status of the Matanomadh sequence it becomes clear that this sequence, in terms of lithostratigraphy should be called as Matanomadh Formation divisible into two members, viz., Laterite Member and Clastic Member, in terms of biostratigraphy as Barren Zone, *Dandotiaspora dilata* Cenozoone, *Couperipollis brevispinosus* Cenozoone and Sponge Zone and in terms of chronostratigraphy as Madh Series.

The relationship between these units is given in Table 1.

TABLE 1

LITHOSTRATIGRAPHY	BIOSTRATIGRAPHY	CHRONOSTRATIGRAPHY
	4. Sponge Zone	} Madh Series
Clastic Member	3. <i>Couperipollis brevispinosus</i> Cenozoone	
	2. <i>Dandotiaspora dilata</i> Cenozoone	
Matanomadh Formation Unconformity	
	1. Barren Zone	

REFERENCES

- BARNES, A. (1834). Memoir on eastern branch of Indus and the Rann of Kutch. *Barnes travels in Bokhara*. 3: 309.
- BISWAS, S. K. (1965). A new classification of Tertiary rocks of Kutch, Western India. *Bull. geol. min. metall. Soc. India*. 35: 1-6.

- BISWAS, S. K. & DESHPANDE, S. V. (1970). Geological and tectonic maps of Kutch. *Bull. Oil natural Gas Commn.* **7** (2): 115-116.
- BISWAS, S. K. & RAJU, D. S. N. (1971). Note on the rock-stratigraphic classification of the Tertiary sediments of Kutch. *Q. Jl geol. Min. metall. Soc. India.* **43** (3): 177-180.
- IDEM (1973). The rock-stratigraphic classification of Tertiary sediments of Kutch. *Bull. Oil natural Gas Commn.* **10** (1-2): 37-45.
- Committee of stratigraphic nomenclature of India (1971). Code of stratigraphic nomenclature of India. *Misc. Publs. geol. Surv. India.* **20**: 1-28.
- MATHUR, Y. K. (1966). On the microflora in the Supra-trappeans of W. Kutch, India. *Q. Jl geol. Min. metall. Soc. India.* **38**: 33-51.
- SASTRI, V. V., MOHAN, M. & GUHA, D. K. (1965). Tertiary biofacies of Kutch, Cambay and Ankleshwar areas, India. *Proc. int. geol. Cong.* **22** (8): 112-131.
- SAXENA, R. K. (1977). Lithostratigraphy of the Matanomadh Formation, Kutch, India. *Palaeobotanist.* **24** (3): 261-262
- WYNNE, A. B. (1872). Geology of Kutch. *Mem. geol. Surv. India.* **9** (1): 1-289.