

Sindhudurg Formation - a new lithostratigraphic unit in Konkan area of Maharashtra

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A distinct, subsurface sequence of clays with carbonaceous and lignitic seams, informally known as Ratnagiri Beds, occurs in the coastal tract of Ratnagiri and Sindhudurg districts of Maharashtra. These beds, being developed in a large area, are mappable with well demarcated lower and upper contacts. A new, formal lithostratigraphic unit-Sindhudurg Formation is proposed for these beds and information regarding its type and reference sections, lithology, nature of contacts, fossil contents, lateral continuity, age, etc. is provided.

Key-words- Lithostratigraphy, Tertiary, Sindhudurg Formation, Ratnagiri Beds, Maharashtra.

INTRODUCTION

WHILE studying the geological set-up of southern Konkan, Wilkinson (1871) reported the occurrence of white and blue clays with thin carbonaceous seams in various well and quarry sections near Ratnagiri and stated them to be of obscure date and origin. These deposits, informally known as Ratnagiri Beds, are capped by a few centimetres thick ironstone layer and contain fossil plants, e.g. woods, leaves, seeds, fruits and palynofossils. This sequence unconformably overlies either Precambrian rocks or Deccan Traps and is covered by a few metres thick laterite.

After Wilkinson's first report, the Ratnagiri Beds could not attract much attention of geologists for over a century, probably because of their thinness and poor exposure. Palynological studies on these beds have been carried out by Phadtare and Kulkarni (1980a, b, 1984a, b), Kulkarni and Phadtare (1983), Kulkarni *et al.* (1985) and Saxena and Misra (1990). Kulkarni and Phadtare (1980) and Dalvi and Kulkarni (1982) studied leaf cuticles and Phadtare and Kulkarni (1984c) described angiospermous woods from these beds.

Saxena *et al.* (1992) made a detailed lithostratigraphic study of these deposits in a number of well, mine, outcrop and other sections in Ratnagiri and Sindhudurg districts of Maharashtra and compiled a composite section of the stratigraphic sequence. They mentioned that these deposits are characterized by a distinct lithologic association and can be easily demarcated from the underlying and overlying rock units. The

fact that these deposits are developed in a large area along the Konkan coast (Map 1) clearly shows their mappability on 1: 50,000 scale. The distinct lithological characters and mappability of these beds allow to rank them as a formation (Article 7, Code of Stratigraphic Nomenclature of India, 1971). A description of the new formation, named as Sindhudurg Formation, is given below:

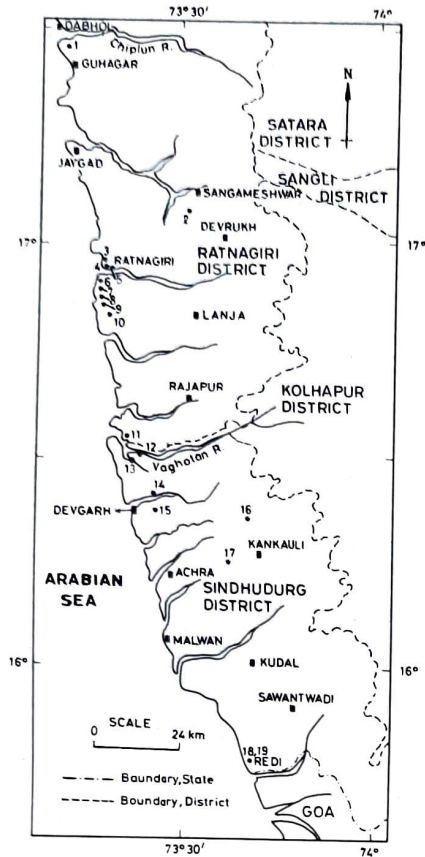
Sindhudurg Formation

Derivation of name- The name of the Formation is derived from the Sindhudurg District where the type section of the formation is located.

Type section - Mavli Mine of the New India Mining Corporation Private Limited at Redi (Lat. 15°46' N; Long. 73°40'E) in Sindhudurg District, Maharashtra (Figs 1,2; Table 1).

Table 1

Sl.no.	Lithology	Thickness
6.	Laterite	variable
5.	Grey sandy clay	2.5 m
4.	Carbonaceous clay	2.0 m
3.	Lignite	1.0 m
2.	Gritty clay	1.0 m
.....tuconformity.....		
1.	Iron ore (Precambrian)	-



Map 1. Lateral extent of the Sindhudurg Formation in Ratnagiri and Sindhudurg districts of Maharashtra. 1. Katle well; 2. Parchuri well; 3. Ratnagiri wells; 4. Bhagwati Bandar; 5. Nachna wells; 6. Kasop well; 7. Vaygani wells; 8. Ranpar; 9. Golap well; 10. Pawas well; 11. Kuveshi well; 12. Tirlot well; 13. Amberiwadi; 14. Mond well; 15. Kalviwadi; 16. Otav Talab; 17. Kirlos; 18. Mavli Mine (NIMCO); 19. Pit no. 1 (Gogte Minerals);

Reference sections - A number of dug-well sections at Katle, Parchuri, Ratnagiri, Nachna, Kasop, Phansop, Vaygani, Golap, Pawas and Kuveshi in Ratnagiri District and Tirlot and Mond in Sindhudurg District and outcrop sections at Amberiwadi and Kalviwadi in Sindhudurg District, Maharashtra (Map 1).

Lithology - The Sindhudurg Formation is composed of whitish-grey to bluish clays, lignite, lignitic or carbonaceous clays and grey clays occasionally mixed with lateritic material. The clays often grade into sandy clays or even into sandstone and occasionally bear ferruginous streaks and patches. The lignite/lignitic clay is covered, in some sections, by a layer of ironstone (0.1-0.3 m thick) often containing marcasite or pyrite. A generalized sequence of beds in the Sindhudurg Formation is given in Table 2.

Table 2

Sl no.	Lithology	Composite thickness
8.	Laterite	variable
7.	Ironstone	0.1-0.3m
6.	Dirty white-greyish clays	0.5-2.2m
5.	Lignitic/carbonaceous clays	0.1-0.4m
4.	Lignite	0.5-2.5m
3.	Lignitic/carbonaceous clays	0.3-0.9m
2.	Whitish grey-bluish clays	1.0-2.5m
.....unconformity.....		
1.	Precambrians/Deccan Traps	



Figure 1. Mavli Mine Section at Redi showing Sindhudurg Formation

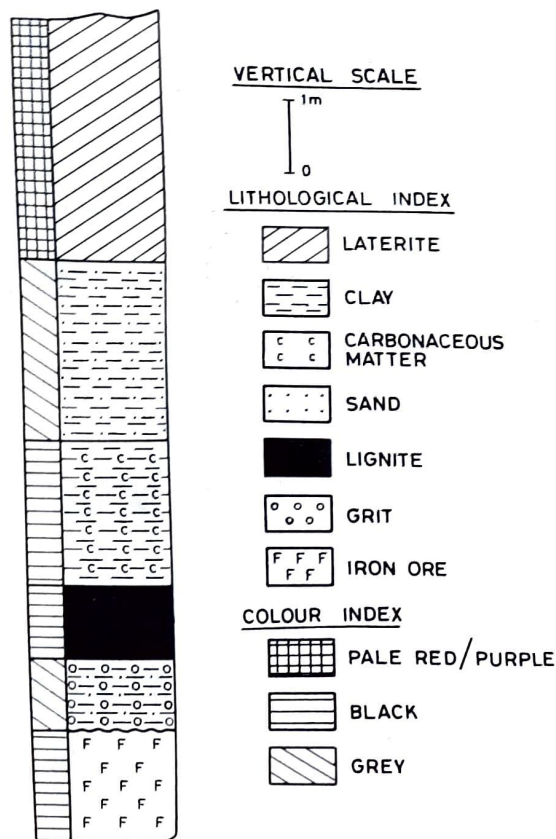


Figure 2. Litholog of the Mavli Mine Section at Redi - the type section of the Sindhudurg Formation.

Nature of contacts - The Sindhudurg Formation overlies the Precambrian rocks or Deccan Traps and their contact is marked by an erosional unconformity. The top of the formation is covered by laterite (Table 3).

Table 3

Sl. no.	Stratigraphic units	Remarks
3.	Laterite	Top eroded in most of the sections.
2.	Sindhudurg Formation	The upper clay is mostly mixed up with lateritic material. The formation is capped by a thin ironstone band.
.....unconformity.....		
1.	Precambrians/Deccan Traps	Traps pinch out in the southern part of Sindhudurg District. Upper part of Precambrian rocks was observed only in Redi mine area.

Fossil contents - The formation is rich in plant fossils. Leaf cuticles belonging to *Nypa* (Nypaceae), *Nothopegia* (Anacardiaceae), *Garcinia* (Clusiaceae), *Alangium* (Alangiaceae) and *Diospyros* (Ebenaceae); carbonized fruits of *Nyssa* and *Terminalia*; and woods of Anacardiaceae (*Dracontomelunoxylon* and *Anacardioxylon*) have been recorded from this formation. This

formation particularly the lignite/lignitic clay bed, is very rich in palynofossils and a large number of palynotaxa have been recorded from it by Phadtare and Kulkarni, (1980a, b, 1984a, b); Kulkarni and Phadtare; (1980), Kulkarni et al. (1985) and Saxena and Misra (1990).

Lateral continuity - This formation has been recorded from a number of localities in dug-wells, mine cuttings and outcrop sections. Its recorded geographical extent is from Katle (Ratnagiri District) in the north to Redi (Sindhudurg District) in the south near Maharashtra-Goa Border (Map 1).

Equivalent informal units - This formation was informally referred as Ratnagiri Beds (Pascoe 1964, Saxena & Misra 1990, Saxena et al., 1992). The lignite bed of this formation has been referred as Ratnagiri lignite in many publications.

Palaeoclimate and environment of deposition - The present day distribution of the palynofossils and other plant remains recorded from this formation suggests tropical-subtropical (warm-humid) climate. The environment of deposition has been inferred as near-shore, possibly lagoonal type, with fresh water swamps nearby.

Age - The age of this formation, as deduced from the palynofossils, is Miocene. This formation appears to be a northward extension of the Warkalli Formation of Kerala.

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REFERENCES

- Committee on Stratigraphic Nomenclature of India. 1971. Code of stratigraphic nomenclature of India. *Misc. Publ. geol. Surv. India* 20: 1-28.
- Dalvi, N. & Kulkarni, A.R. 1982. Leaf cuticles from lignite beds of Ratnagiri district, Maharashtra. *Geophytology* 12 (2): 223-232.
- Kulkarni, A.R. & Phadtare, N.R. 1980. Leaf epidermis of *Nypa* from lignite beds of Ratnagiri district, Maharashtra. *Geophytology* 10: 125-128.
- Kulkarni, A.R. & Phadtare, N.R. 1983. Pollen of *Nypa* from lignite beds of Ratnagiri district, Maharashtra. *Phytomorphology* 31(1-2): 48-51.
- Kulkarni, A.R., Phadtare, N.R. & Dalvi, N. 1985. Monocotyledonous pollen grains from Ratnagiri lignite: pp. 295-313 in Verghese, T.M. (Editor)- *Recent advances in pollen research*. Allied Publishers Private Limited.
- Phadtare, N.R. & Kulkarni, A.R. 1980a. Palynological investigation of Ratnagiri lignite, Maharashtra. *Geophytology* 10: 150-170.
- Phadtare, N.R. & Kulkarni, A.R. 1980b. *Laevigatosporites ovalis* Wilson & Webster with sporangium from lignite beds of Ratnagiri district. *Curr. Sci.* 49: 603.

- Phadtare, N.R. & Kulkarni, A.R. 1984a. Palynological assemblage of lignite exposures of Ratnagiri district: pp. 515-532 in Badve, R.M. *et al.* (Editors)- *Proc. 10th Indian Colloquium Micropaleont. Stratigr. Pune 1982*. Maharashtra Association for the Cultivation of Science, Pune.
- Phadtare, N.R. & Kulkarni, A.R. 1984b. Affinity of genus *Quilonipollenites* with the Malaysian palm *Eugeissona* Griffith. *Pollen Spores* 26: 217-226.
- Phadtare, N.R., & Kulkarni, A.R. 1984c. Woods of Anacardiaceae from lignite beds of Ratnagiri district, Maharashtra : pp. 232-241 in Tiwari R.S. *et al.* (Editors) - *Proc. 5th Geophytological Conference Lucknow 1983*. Palaeobotanical Society, Lucknow: 232-241.
- Saxena, R.K. & Misra, N.K. 1990. Palynological investigation of the Ratnagiri Beds of Sindhu Durg district, Maharashtra. *Palaeobotanist* 38: 263-276.
- Saxena, R.K., Misra, N.K. & Khare, S. 1992. Ratnagiri Beds of Maharashtra-lithostratigraphy, flora, palaeoclimate and environment of deposition. *Indian J. Earth Sci.* 19(4): 205-213.
- Wilkinson, C.J. 1871. Sketch of geological structure of the southern Konkan. *Rec. geol. Surv. India* 4: 44-47.