

A PRELIMINARY NOTE ON THE AGE OF THE SALINE SERIES IN THE PUNJAB SALT RANGE

THE age of the Punjab Salt and its associated marl has been one of the most outstanding controversial problems of Indian geology.

Normally, in the Cis-Indus Range it lies below the known Cambrian beds; while in the Trans-Indus Range its normal position is below the known Tertiary limestones. Some geologists have assigned to the Saline Series the age according to their normal stratigraphical position, having postulated that the two salt deposits are widely different in age. Sir Edwin Pascoe in his memoir¹ has dealt with this subject very exhaustively and has concluded that the Cis-Indus and Trans-Indus salt deposits are of the same age, viz., Tertiary, and that its anomalous position in the Cis-Indus range is due to an overthrust. But this view has been questioned by some of the present geologists of the Geological Survey of India with long experience of field-work in the Salt Range.

A. B. Wyne, one of the earliest authorities on the Salt Range, was in favour of Cambrian age of the Cis-Indus Saline series. In his pioneer work² he has stated "that every one who has examined the ground pronounces the salt marl unfossiliferous, but I am not aware that any of it has been subjected to microscopic examination". This view prevailed until recently and it is not known whether the rocks of the Saline series have been subjected to exhaustive microscopic examination in search of micro-fossils. Dr. B. Sahni of the Lucknow University has examined samples of marl and salt sent to him by me from the Warchha and Khewra Mines. The results of part of the work were published in the April 1944 number of *Nature* (p. 462). Most of the samples examined for microfossils have been found to be highly fossiliferous. That all the samples were collected from beds *in situ* either from within the salt seams or from beds immediately below the main seams has been guaranteed by me. It has, therefore, been established that the salt of the Cis-Indus Range is not of Cambrian or pre-Cambrian age but belongs to the Tertiary period.

This settles that the Cis-Indus and Trans-Indus salt deposits are of the same age. It has not yet been possible to determine the exact horizon of the Saline Series from a microscopic examination of the plant fossils. But it can be fixed very accurately because of the lithological similarity of the rocks of the Saline Series with the succession of beds in the Potwar plateau.

The Tertiary beds in the Fatehjang area in the Attock district, and as met with in boreholes of oil wells in the Khaur and Dhulian oil fields, have been classified by Mr. E. S. Pinfold.³ The junction of the Murrec series with the Eocene is unconformable and the basal part of the former is termed the 'Fatehjang zone'. Below this are the Nummulite beds termed 'passage beds' or 'A' beds. Underlying these are the purple shale beds with

purple sandstone at top and these are termed 'B' beds. Below these is the fresh-water *Planorbis* Limestone and then the Hill Limestone (Laki and Ranikot), wherein petroleum is believed to have originated. From the stratigraphical position of the Rocksalt in the Trans-Indus Range at Kohat and from analogous petrological characters and the gypseous nature of the series in the Cis-Indus Range, there is little doubt that the Saline Series is identical with the 'B' beds in the oil series. As petroleum originated in the beds below the 'B' beds, the bituminous character and smell of oil in the Trans-Indus salt can easily be understood.

It has, therefore, been established that the age of the Saline Series in the Punjab Salt Range is Upper Eocene (Kirthar). It is hoped that Dr. B. Sahni will be able to confirm this by the isolation of definite forms of micro-organisms belonging to this horizon. It is worth mentioning that Purple Sandstone above the Saline Series which had been assigned a Cambrian age heretofore is associated with the Saline Series and there is little doubt that this is also of the same age as the Saline Series, viz., Upper Eocene. Dr. Sahni may be able to confirm this as well by microscopic examination of these rocks, which have been so far pronounced to be unfossiliferous.

Mayo Salt Mines,
Khewra (Punjab),
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1. *Mem. G.S.I.*, 1920, 40, part 3. 2. *Ibid.*, 1878, 14.
3. Pinfold, E. S., "Structure and Stratigraphy of N.W. Punjab", *Rec. G.S.I.*, 1918, 49, 137-60.

A STUDY OF ACTINOCYCLINA LUCIFERA AND CALCARINA CALCITRAPOIDES OCCURRING IN CALCAREOUS CLAY BED OF NUMMULITIC LIMESTONE SERIES, OF TADKESWAR, SURAT DISTRICT

Introductory.—The Nummulitic Limestone series belonging to Eocene period is well developed at Tadkeswar (21°-22'-30" N. and 73°-4' E.) about 9 miles east of Kim Railway Station.

General.—According to Wynne¹ and Blanford² the series is actually divided into ten distinct beds of limestone, calcareous clay, sandstone and conglomerate. Out of these only three beds, namely, Nummulitic limestone and calcareous clay with yellow boulder limestone are of any interest to a palaeontologist.

Previous Workers.—Several geologists worked in the area, of whom Wynne,¹ Blanford,² Dr. J. Carter,³ and S. R. Narayana Rao⁴ have tried the palaeontological side. The species belonging to genii *Orbitoides* and *Calcarina* are not mentioned so far by any of these workers—perhaps due to their microscopic nature which make it difficult to trace in the massive limestone. But if we make a detailed search in the residual calcareous clay overlying the massive Nummulitic limestone we find complete