

## STRATIGRAPHY OF JAISALMER BASIN, RAJASTHAN

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### ABSTRACT

Jaisalmer basin is an integral part of a major tectonic province known as "West Rajasthan Shelf" which is located to the west of Aravalli ranges and represents the eastern shelf part of the Indus basin. The shelf is carved out into a number of sedimentary basins viz. Jaisalmer, Bikaner- Nagaur and Barmer. Jaisalmer basin has well documented history for Paleozoic, Mesozoic and Cenozoic rock sequences and occupies an area of 42000 sq. km.. An exhaustive study of the surface and subsurface sedimentary sequences has been possible in this basin due to availability of voluminous subsurface data generated through drilling in course of oil exploration by ONGC. Tectonically this entire basin is divisible into four geotectonic blocks which from north to south are Kishangarh sub-basin Jaisalmer - Mari High, Shahgarh sub-basin and Miajlar sub-basin (Fig-1).

Jaisalmer basin is a pericratonic basin and represents mainly the westerly dipping eastern flank of the Indus Shelf. Structural style of the basin has been controlled by master faults. Existence of strike slip regime with its complementary structural styles governing sedimentation history has been noticed in the basin. Its maximum effect is limited between Ramgarh and Kanoi master faults which are very extensive and can be traced from outcrop to subsurface. Tectonic map of Jaisalmer indicates an arcuate belt of north east-south west striking Mesozoic and Tertiary sequences. The general dips of outcropping formations are gentle to flat with minor system of enechelon and oblique faults. The explored area of this basin constitutes a dip slope at the rate of  $3^{\circ}$  to  $5^{\circ}$ . The structural trends in Jaisalmer basin are mainly NNW-SSE or NW-SE corresponding to Dharwarian trend alongwith NE-SW trending aravalli ranges. Jaisalmer-Mari High is not a simple upwarp in basement affecting overlying sediments. This high is present day gravity high feature located along the shoulder zone of Kanoi fault and is attributed to a upthrusting and wrench faulting. It is rather a zone of lifted fault blocks. Its western flank is down faulted to the south west along a series of trending en-echelon step faults. Shahgarh sub-basin is deepest depression and is less disturbed having NNE-SSE trending faults, while structurally simpler Miajlar sub-basin is located in southern extremity of the basin.

Jaisalmer basin experienced first sedimentation on igneous/metamorphic basement during Upper Paleozoic period and constitutes huge sedimentary thickness of the order of 10,000 meters or so which continued up till Recent. However, on southern extremity of the basin, formations of Proterozoic to Early Cambrian age are exposed, which are expected to continue in Miajlar sub-basin but this area has not been drilled so far. Lithostratigraphic units of Jaisalmer basin are well exposed in eastern extremity of the basin between Ramgarh, Kuri and Lathi. The maximum development of lithofacies is observed in deeper parts of the basin but some of these do not extend to surface. Tertiary stratigraphy of exposed and subsurface sequences was adequately revised and standardized by the author (Singh, 1984). Subsequently, author also presented the updated Mesozoic-Tertiary stratigraphy of the basin while discussing its biostratigraphy in detail (Singh, 1996). The stratigraphic column of sedimentary sequences of Mesozoic and Tertiary formations alongwith their thicknesses, age and brief lithology is given in figure-2.

Regional Stratigraphy of the basin has been worked out in accordance with the guidelines given in International sub-commission of stratigraphic classification (1976). In establishing the stratigraphy of Jaisalmer basin, a persistent problem has been faced in formalising the stratotype of a particular formation. Most of the authors have discussed distribution of the formation rather than indicating a type section of definite locality. Consequently, complete section of a formation is not available at one place. In such circumstances, the concept of type locality is invoked and essentially such type localities were taken into consideration where lower and upper boundaries could be marked (boundary stratotypes). Three major unconformities have been mapped in the basin, which differentiate four main sequences belonging to Proterozoic-Early Cambrian, Paleozoic-Mesozoic, Tertiary and Quaternary. In all, fifteen formations have been mapped in the basin out of which three formations namely Bhuana, Goru and Parh do not extend to the surface. Similarly Habur Formation is restricted to outcropping area except in subsurface of Bhuana area. Non-extension of marine Paleocene on surface, facies changes in basin ward areas additional development of a few members of the formations, condensation and extreme thinning of certain formations in shoreward areas have been observed. The surface and subsurface sedimentary sequences could be tied up precisely based on adequate biostratigraphic control and stratigraphy has been standardised.

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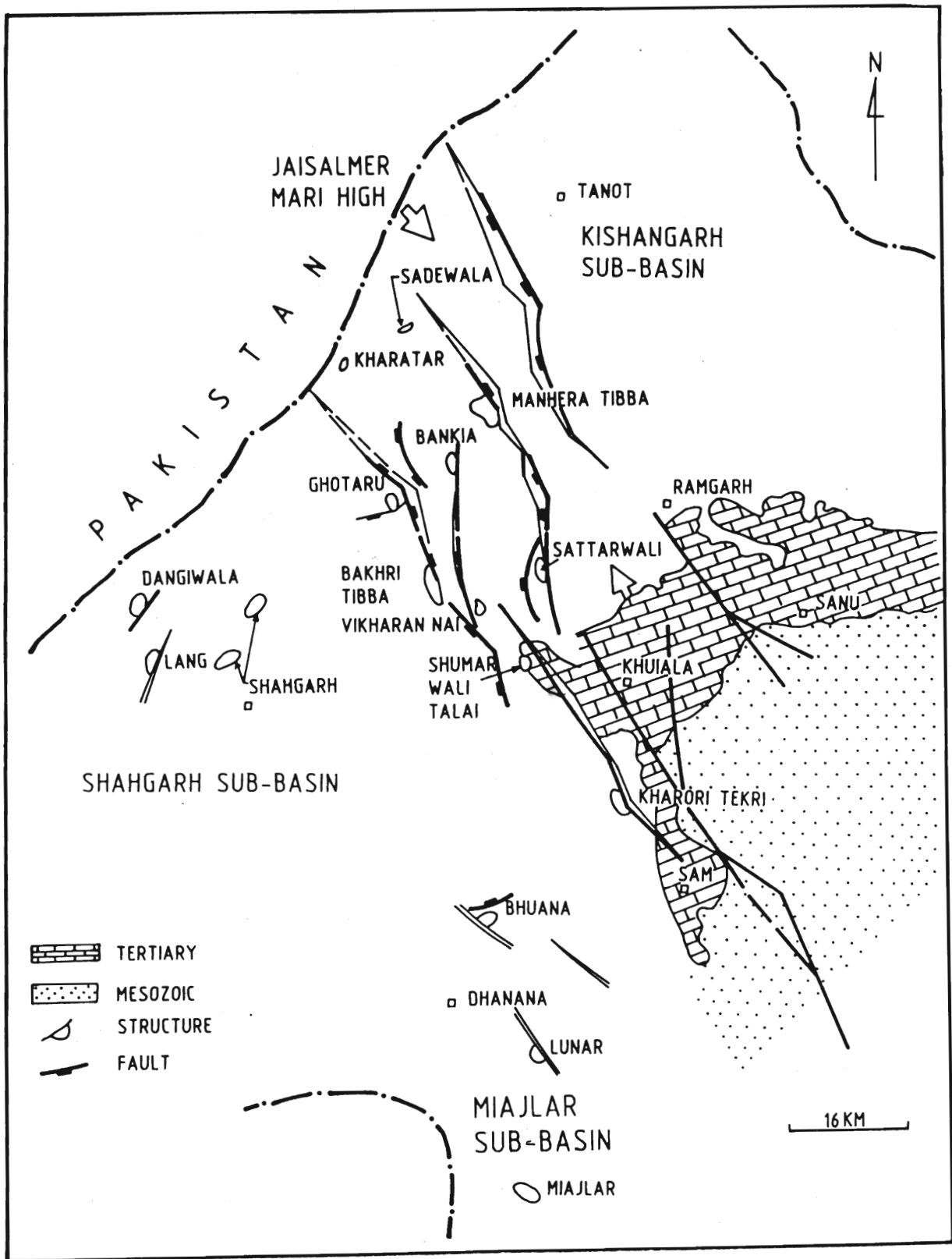
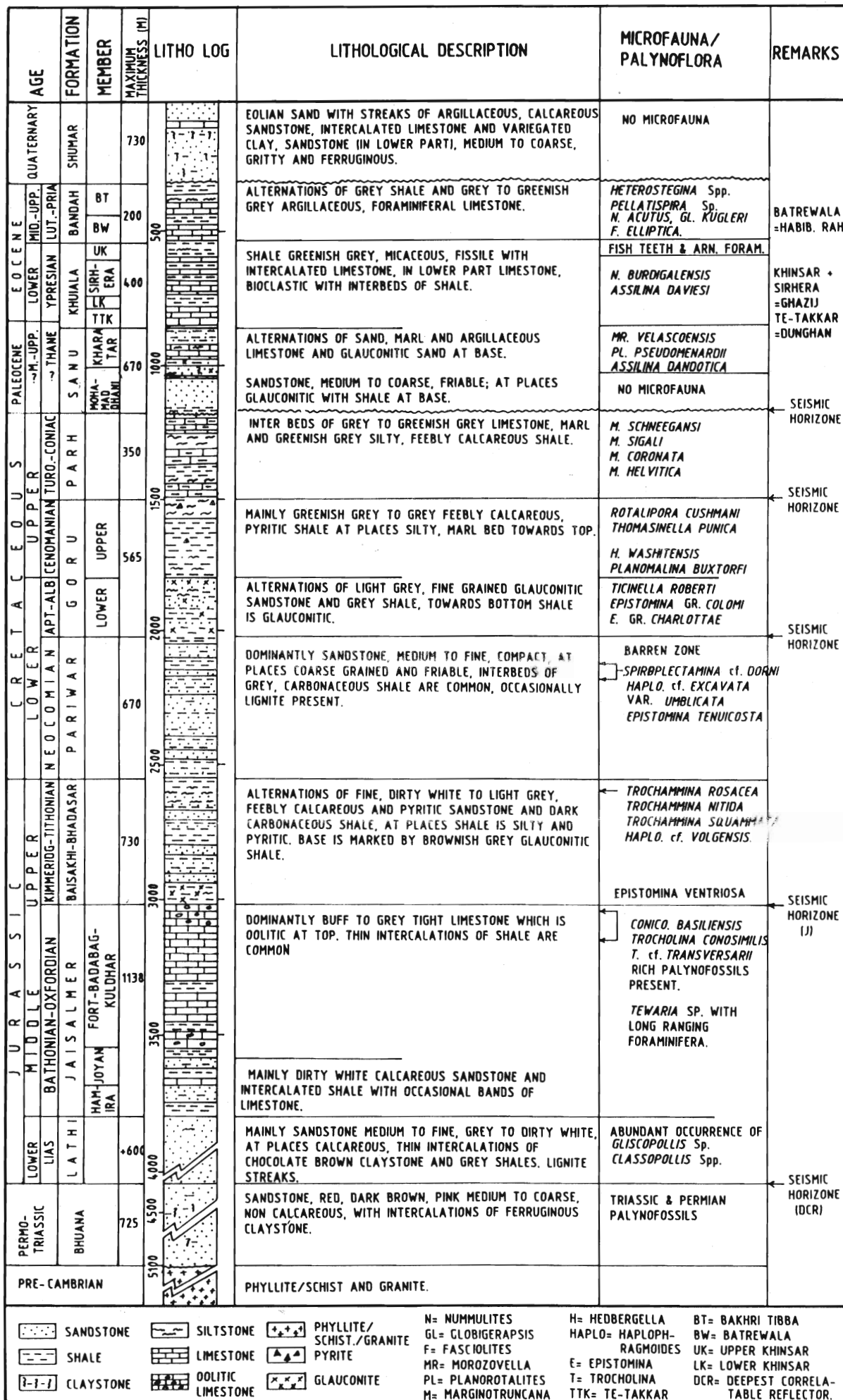


FIG. 1 : LOCATION MAP OF JAISALMER BASIN



- |           |                   |                          |                    |                          |   |
|-----------|-------------------|--------------------------|--------------------|--------------------------|---|
| SANDSTONE | SILTSTONE         | PHYLLITE/SCHIST./GRANITE | N= NUMMULITES      | H= HEDBERGELLA           | BT= BAKHRI TIBBA                          |
| SHALE     | LIMESTONE         | PYRITE                   | GL= GLOBIGERAPISIS | HAPLO= HAPLOPH-RAGMOIDES | BW= BATREWALA                             |
| CLAYSTONE | OOLITIC LIMESTONE | GLAUCONITE               | F= FASCIOLITES     | E= EPISTOMINA            | UK= UPPER KHINSAR                         |
|           |                   |                          | MR= MOROZOVELLA    | T= TROCHOLINA            | LK= LOWER KHINSAR                         |
|           |                   |                          | PL= PLANOROTALITES | TTK= TE-TAKKAR           | DCR= DEEPEST CORRELATION TABLE REFLECTOR. |
|           |                   |                          | M= MARGINOTRUNCANA |                          |   |

(Modified after Singh, 1996)

FIG. 2 : GENERALISED SUBSURFACE STRATIGRAPHY OF JAISALMER BASIN