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A Review on Lithostratigraphy and Biostratigraphy of Jaisalmer basin, western Rajasthan, India

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Abstract

Jaisalmer basin is a pericratonic basin which deepens to southwest and lies on northwestern slope of Jaisalmer Mari basement arch. The basin is a late Paleozoic-Mesozoic basin with angle of dip 3° to 5°, comprises rocks of Permian age which unconformably overlie on Proterozoic basement. The basin is characterized by eastern shelf part of large Indus basin. The basin has thick sedimentary alternating sequence of clastics and carbonates. The rocks of Mesozoic age are well exposed in this basin and represented mainly by limestone, shale, siltstone and sandstone. The entire Mesozoic is divisible into six mappable formations Lathi, Jaisalmer, Baisakhi, Bhadasar, Pariwar, and Habur ranging in age from Lias to Albian. The basin embodies with various variety of micro and mega fossil assemblages in which foraminifera, ostracoda, corals and some plant fossils are common. Among all the formations, Jaisalmer formation are most fossiliferous. The kuldhar member of this formation are represented by Callovian Ammonites, brachiopods, nautiloids, bivalves, echinoids, crinoids and some trace fossils belongs to the family of laginidae and spirillinidae. This review paper embodies formation wise description of Jaisalmer basin with rock types, fossils and age.

Keywords: Lithostratigraphy, biostratigraphy, fossil, formation, Jaisalmer basin, Rajasthan basin, India.

Introduction

India is the fourth largest energy consumer of oil and gas in the world. Indian Plate is bestowed with 38 sedimentary basins in which 8 are of hydrocarbon prospective basins¹. Overall they covers approximately 3.14 million km(sq) in both onshore and offshore regions. Most of present production comes from young passive margin and rift type of basins which are mostly of Tertiary age, whereas other basins are compressional fold thrust and fore deep basin types¹. Most of the basins are peri-cratonic in nature, bordering the Indian plate radially.

Recent research depicts that only 22% of Indian basinal area is very well explored, whereas 44% of total area is in initial exploration stage and rest of 34% of the total area is either poorly explored or totally unexplored. In order to examine present and future scenarios of oil and gas exploration, the petroliferous basins are categorized into four categories.

The Rajasthan basin covers about 1,20,000km (sq) area with the recent sediments to the western Aravalli, up to Pakistan border. The basin is divided in to three sub-basins such as Jaisalmer basin, Bikaner-Nagaur and Barmer sanchor, these sub basins are separated by faults. Jaisalmer basin is located in the west of Aravalli ranges. It covers major part of Rajasthan basin and occupies about 50,000 km (sq). It is divided in to three depressions which are Shahgarh depression, Kishangarh depression and Miajlar depression. It is a pericratonic basin dipping about 3° to 5° , deepens to southwest and lies on northwestern slope of Jaisalmer Mari basement $\operatorname{arch}^{2,3,4}$. Three major unconformities have been mapped which separates four

main sequences belonging to Proterozoic-Early Cambrian, Paleozoic-Mesozoic, Tertiary and Quaternary. In the west basin represents Quaternary sediments, grading to Tertiary and then Mesozoic formations proceeding eastwards⁵.

Lithostratigraphy

The Jaisalmer basin is a late Paleozoic-Mesozoic basin with rocks of Permian age resting unconformably over the Proterozoic basement. Especially the Malani suite of Precambrian age and metamorphic rocks constitutes the basement for the Jaisalmer basin. The basin has thick sedimentary alternating sequence of clastics and carbonates. The rocks of Mesozoic age are well exposed in this basin and are represented by mainly limestone, shale, siltstone and sandstone⁶. The basement of basin mainly consists of Pre-Cambrian rocks especially Igneous Suites of Malani and metamorphosed rocks like phyllite and schist which act as basement for different sedimentary formations in the western Rajasthan basins.

Randha Formation: Randha formation mainly consists fine to coarse grains thickened bed, with calcareous quartzite, sandstone including shale intercalations⁷. The lower base of formation is unconformable with underlying basement complex whereas the upper base consist of cherty red clays indicating slight break in sedimentation which suggests contact between Randha and Birmania formations. The age of this formation are about Proterozoic to Lower Cambrian. The association like red shales, calcareous quartzite sandstone and sandy shale represents fluctuating environment.



Figure-1 Sedimentary basins of India^{1,8,14}

Birmania Formation: The Birmania formation consists dolomitic and oolitic limestone bands with thickness about 2,000 m⁷. The formation unconformably overlies Randha Formation and upper contact is unconformable with Lathi Formation. The formation dominantly consists of carbonate sequence of grey, cherty, dolomitic limestone with inter beds of shale and calcareous sandstone. The lithology of this formation is dark grey shale, dense dark grey cherty limestone with inter bedded chert suggesting marine environment. The age of this formation is proterozoic to Lower Cambrian.

Bhuana Formation: This formation lies on greenish, grey schists and pyllites of Precambrian age and is conformable with overlying Lathi Formation⁷. This formation is represented by sandstone with inter bedded claystone and shale with the variation in color. The colour of sandstone ranging from grey to greyish, white, brownish white, pinkish white to pink and even purple.

The entire Mesozoic is divisible into six mappable formations Lathi, Jaisalmer, Baisakhi, Bhadasar, Pariwar, and Habur ranging in age from Lias to Albian⁸.

Lathi Formation: Oldham, first named this formation as "Lathi Beds" but Swaminath *et al* renamed it as Lathi Formation. The base of formation comprises conglomerate with coarse sandstone and conformable with overlying Jaisalmer Formation. The formation consists arenaceous sequence of sandstone with intercalations of shale, claystone and some lignite. This formation is well exposed in south, southeast and east in Jaisalmer district. The thickness of this formation progressively increases towards northern and western part of basin. The formation have not encountered any major lithological variation except conglomerate. The depositional environment of this formation is fluvio-deltaic. The formation is sub divided into two members namely Odania and Thaiat.

Odania Member: This member consists conglomerate as base followed by sandy siltstone, ferruginous sandstone and arkosic sandstone. It represents different angles of cross beds, ferruginous sandstones (well cemented and poorly sorted), quartzite, sandy siltstone (white to maroon) and arkosic sandstone. **Thaiat member:** This member comprises alternating sequence of siltstone, sandstone and claystone. In comparision to the Odania Member, Thaiat Member predominantly composed of siltstones.

Jaisalmer Formation: The Jaisalmer formation is overlain by Lathi Formation and underlain by Baisakhi Formation⁹. The jaisalmer formation represents mainly marine Mesozoic succession near the jaisalmer town. The maximum thickness of formation is reported about 1138 m in Ghotaru area. The formation is well exposed in south eastern part of Jaisalmer-Mari high around Jaisalmer town, which mainly consists of yellow colour fossiliferous limestone with intercalation of calcareous sandstone. The basal part of formation is characterized by calcareous sandstone, shale with intercalations of oolitic grainstone, mudstone and wackestone microfacies, whereas the upper part of formation is represented by thick limestone sequence comprising oolitic-bioclastic grainstone, wackestone and mudstone microfacies. The Formation also consists predominantly of calcareous sediments. This Formation predominantly comprises limestones, sandstones, conglomerates, siltstones and marls. The cross bedded beds exhibits some bioturbated and ripple surface in this formation. Oldham, first named this formation as "Jaisalmer Limestone" which later renamed by Swaminath and Naravanan as Jaisalmer Formation. They divided Jaisalmer Formation in to four members, which were Joyan member, Fort member, Bada bag member and Kuldhar member. But later. Das Gupta added Hamira Member and Kachhara and Jodhawat recognized the upper most Jajiya Member in Jaisalmer formation.

Therefore, Jaisalmer Formation comprising six members: Hamira Member: It is the basal member of Jaisalmer Formation, overlying the Lathi Formation. It is composed of limestone (yellowish white) with intercalations of thin dirty white marl bands. It also consists fine to medium grain size sandstones and limestones (brown, grey, yellow) of about 2 m width.

Joyan Member: This member is underlain by Hamira Member containing poorly cemented sandstone, fossiliferous limestone and shales (light yellow). The lower part of this member mainly composed of siliciclastic sediments. The uppermost bed of this member is represented by mega-ripples on the surface.

Fort Member: This member is underlain by Joyan Member and overlain by Badabag Member which comprises fine to medium grain size sandstone (greyish white), followed by several beds of oolitic, sandy, bioturbated fossiliferous limestone (yellowish brown)⁹. The best exposed area of this member are along the Jaisalmer Fort escarpments.

Badabag Member: This member is followed by Fort Member, composed of ferruginous siltstone, intra formational conglomerate, calcareous sandstone (greyish white) which is overlain by oolitic limestone (yellowish brown).

Kuldhar Member: It is most fossiliferous member among all members, having fossiliferous limestone with alternation of limestone and shale⁹. The rock assemblage of this member consisting oolitic limestones, oolitic shales, sandstones and ferruginous silty marls.

Jajiya member: It is the top most as well as richly fossiliferous member of Jaisalmer Formation represented by oolitic limestone with intercalations of sandstone and shales^{9,10}. Due to its distinctive lithology and age it was separated.

Baisakhi Formation: This formation is sub divided into three members, which are as follows;

Lanela Member: It comprises grey to black shale commonly ferruginous in nature and rare remains of plants.

Ludherwa Member: It comprises brown hard argillaceous, sandstone and intraformational conglomerate.

Rupsi member: It is mainly characterized by shale of grey to greenish color which is intercalated with sandstone of light brown color. The formation conformably overlies Jaisalmer formation whereas upper limit is slightly unconformable. The formation is represented by grey, greenish grey to black shale, argillaceous sandstone and intraformational conglomerate.

Bhadasar Formation: The rocks of Bhadasar Formation consists of ferruginous sandstone with intercalations of thin beds of clay, siltstone, shale and these are well exposed in and around Bhadasar, Kolar Dungar, Mokal villages and also along the Jaisalmer-Ramgarh road. Das Gupta, subdivided the Bhadasar Formation into two member such as Kolar Dungar Member and Mokal Member. This formation is dominantly composed of arenaceous sequence of ferruginous sandstone.

Kolar Dungar Member: This member acts as the base of the Bhadasar Formation and it is best exposed in Bhadasar village and Kolar Dungar hill where it attains maximum thickness. This member consists alternation of ferruginous gritty sandstone and cemented sandstone beds with intercalations of calcareous clay.

Mokal Member: This member is conformably overlie on kolar dungar member and well exposed at Bhadasar in Mokal village. It comprises argillaceous ferruginous and calcareous sandstone of brown colour. It also includes fossil wood, fish teeth and ammonite, gastropods, bivalves, etc.

Pariwar Formation: Earlier known as Parihar beds (Oldham). The Pariwar formation mainly consist of arenaecous rocks with no typical fossil record except few plant fossils. At the base, the formation is composed of sandy siltstone and calcareous sandstone. In the middle part, the formation is composed of arenaceous clay with rich plant fossils, whereas the topmost of formation contains sandstone and siltstone with some impressions of plant fossils. The formation is deposited under shallow marine condition which is represented by the presence of glauconitic sandstone and shales.

Habur Formation: The Habur formation mainly comprises alternation of calcareous sandstone, limestone in lower part and poorly bedded calcareous sandstone, sandy marls and limestone in upper part. Intraformational breccia and ferruginous clays are reported with intercalation of clays and limestones. The top of formation composed of grey coloured limestone interbedded with shale. The depositional environment of this formation is shallow marine.

Goru Formation: This formation consists of calcareous shale with calcareous siltstone, fine grained argillaceous micaceous sandstone, sealed by marl bed, This formation is divided into two members.

Lower Goru Member: It consists of glauconitic greenish grey silty clay and overlain by alternations of shale and sandstone.

Upper Goru Member: It mainly consist of argillaceous unit composed of shale, siltstone and marl where shales are grey to greenish in colour, siltstones are light grey in colour and marl are dark to greenish grey in colour.

Parh Formation: This formation consists of argillaceous limestone, marl sequence and calcareous clays. The limestone is grey, light grey to greenish grey in colour acts as a base, the clay is greenish grey and highly calcareous in nature whereas the marl is buff to greenish grey. The upper limit of this member is represented by major unconformity.

Biostratigraphy: The Mesozoic rocks of Jaisalmer basin are studied by various researchers for paleontological aspects¹¹. The marine sedimentary rocks of Jaisalmer basin deposited during the Mesozoic. The area is represented by siliciclastic and carbonates rocks and composed of several formations with variety of fossil assemblages. Among Lathi, Jaisalmer, Baisakhi, Badasar, Pariwar and Habur, Jaisalmer formation is most fossiliferous. These formations are constitute of different fossil assemblages with different rock types.

Randha/Birmania Formation: These formations does not represent any typical fossil assemblage, however only gymnosperm wood fossils are found.

Bhuana Formation: This formation is devoid of microfauna, but rich in palynofossil assemblage, which is divided into two palynozones representing Permian and Triassic. The environment of deposition is fluvial to shallow marine.

Lathi Formation: Fossil wood of Gymnosperm has been reported in the Lathi formation. And leaf impressions of *Pterophyllum sp.*, *Ptilophyllum acutifolium* and *Equisetales* sp. has also been reported near Devikot area. The impressions of trace fossils such as *Planolites*, *Ophiomorpha*, *Thalassinoides* are found in Odania member. Whereas trace fossils such as

Thalassinoides, jenense, Rhizocorallium, Gyrochorte and Teichichnus with varieties of gastropods and bivalves has been found in Thaiat member. A rich fossil assemblage of palynoflora has been also recognized in the formation, which comprises abundance of Spheripollenites, Slassopllis, Gliscopollis, Araucariacites and Inaperturite. Based on this assemblage lower Jurassic age has been assigned to this formation and fluvio-deltaic environment has been suggested after the recognition of fossilized tree trunks, cross bedding, and coarse ill sorted sandstone in lower part.

Jaisalmer Formation: Most fossiliferous formation among all the formations. It comprises rich fossil assemblage of Bivalves, Gastropods, Brachiopods, Cephalopods. It has both mega as well as micro fauna¹². The mega fossils such as Ammonoids (Kinkeliniceras Hinctes sp., Properisphinctes., sp., Lissceratoides., Klematosphinctes., Obtusicotites sp.), are best reflectors of age in Jurassic successions, Belemnites(Belenopsis orientalis, Belenopsis sp.), Gastropoda (Pleurotomoria reticulata. *Natica elegane* and Nerina), Brachipoda (Rhynchonella microrhyncus, R. nobilis, R. indicus, R. The brevicostata. *Terebratulata*). formation contains microfossils of Foraminifera and Ostracoda. The characteristic Foraminifera of this formation are as follows; Epistomina coronata, E. reularis, Epistomina cf E turgidula, Kurnubia cf. K. variablilis, Lenticulina muensteri, L. subalata, Opthalmidium cf. O. carinaum, Pfenderina cf. P.neocomiensis, Rinholdella cf. *R. crebra. Triplasia australiae* Crespin and *Trocholina conica.* The Jajiya member of this formation embodies foraminiferal assemblage with 23 species of family Vaginulinidae. These foraminiferal assemblages are use to interpret paleographic conditions and depositonal environment as well, and can be used further for dating and correlation. The characteristic Ostracoda of this formation are as follows; Amicytheridea, ihopyensis, A. triangulata, Bairdia hilda, Cytherella disjuncta, C. fullonica, Cytherelloidea jugosa, C. paraweberi, Ektyphocythere parva, Ektyphocythere cf. E. triangulata, Fastigatocythere accessa F. jugalandia, Gluptocythere persica, Lophocythere brandiana, L. Metacytheropteron drupaceum, scabra, Monoceratina pararossae, M. scarboroughensis, Paracypris contrmia, Progonocythere laevisula, Terquemula blakeana and Trichordis cf. T. triangula. The lower part of formation having Amarsagar Limestone Member which represents the fossils assemblages of Bivalves, Echinoids, Gastropoda, Brachiopoda in association with marl, oolitic, interbedded sandy shale and sandstone. Whereas the upper part of the formation comprises fossil of assemblages Ammonites, Bivalves, Gastropods, Echinoderms, Bryozoans, and Corals. On the basis of fossil assemblages the age of Jaisalmer Formation ranges from Bajocian to Oxfordian.

Hamira Member: It is the lowermost member of the Jaisalmer Formation, which lie upon Lathi Formation. It is represented by fine to medium grain size calcareous sandstone and limestone (greyish, brownish, yellow), with scattered fossil assemblages of Bivalves, Brachiopods and trace fossils like *Skolithos*, *Rhizocorallium, Taenidium, Planolites*, colonial corals, crinoid fragments, solenoporacean algae and wood fossil. Some new record of nuculids (*Palaeonucula*), oysters, *etc.* are also been reported in this member. On the basis these fossil assemblage, Late Bajocian age is assigned to this member.

Joyan Member: The basal part of this member is represented by siliciclastic sediments. Whereas upper part is represented by record of Corals and Bivalves which includes *Corbula*, *Myoconcha*, *Mytilus*, *Modiolus*, *Nanogyra*, *Isognomon*, *Inoceramus Trigonia*, *Palaeonucula*, *Protocardia and Gervillia*. The coquinoidal limestone and gritty sandstone of this member comprises trace fossils record of *Rhizocorallium jenense*, *Chondrites* sp., and *Rosselia* sp. Therefore, Bajocian age is assigned to this member on behalf of concerned fossil assemblage.

Fort Member: The best exposed area of this member are along the Jaisalmer Fort escarpments, consisting carbonate rich zone which is highly fossiliferous comprising various taxa of Brachiopods, Gastropods, Bivalves, Echinoids, Bryozoans, Corals and Foraminifera. Bivalves are in the form of *Eomiodon* sp., *Corbula* sp. and *Dacryomya lacryma* and foraminifera are in the form of *Sporobulimina rajasthanensis*, *Tewaria* sp. and *Dorothia poddari*. Some trace fossils such as *Arenicolites tenuis*, *Bichordites* sp., *Thalassinoides* sp., *Skolithos* sp., *Planolites* sp., *Rhizocorallium irregulare*, *Rhizocorallium jenense*, and *Taenidium serpentinum* are also been recorded. Therefore Early Bathonian to Middle Bathonian age is assigned to this member.

Bada Bag Member: This member comprises rock assemblage of sandstone (calcareous), limestone (dolomitized), siltstone and intraformational conglomerate with assemblages of Bivalves like Trigonia, Dacryomya lacryma, Brachiopods like Globirhynchia *G*. amarsagarensis, jaisalmerensis, jaisalmerensis *Plectoidothvris* and Ammonoid like Clydoniceras. Trace fossils assemblages such as Gyrochorte, Ophiomorpha, Thalassinoides, Planolites, Rhizocorallium, Asterosoma, Taenidium, Arenicolites, Skolithos and 'pearlstring' Ctenopholeus kutcher are also been reported which suggesting a shallow water depositional environment. Based on the fossil record of the ammonites, Late Bathonian age is assigned to this member.

Kuldhar Member: This member is very well fossiliferous with faunal fossil assemblages such as Callovian ammonites *Collotia gigantea*, *M. chariensis*, *Macrocephalites semilaevis*, *Reineckeia anceps*, *Subkossmatia opis*, Nautiloids, Belemnite guards, Rhynchonellid, terebratulid Brachiopods, Bivalves, Echinoids, and Crinoids. Moreover, trace fossils (micro fauna) are also present which belongs to family laginidae and spirillinidae. Based on the ammonite assemblages, Callovian age is assigned to this member.

Jajiya Member: It is the uppermost member of the Formation, richly fossiliferous, comprising fossil assemblages of Bivalves, Ammonoids, Gastropods, Foraminifera and terebratulid Brachiopods. The Ammonoid assemblage are in the form of Lissoceratoides, Brightia, Distichoceras, Dhosaites, Mavaites, Alligaticeras, Properisphinctes, Epimavaites, and Klematosphinctes. The Jajiya Member embodies 23 foraminiferal species from family Vaginulinidae are Reophax subgoodlandensis, Reophax aff. R.suevica, Ammobaculites coprolithiformis, Dentalinoides aff. D. antennula. Laevidentalina guembeli, Pyramidulina aff. P. issleri, Lenticulina muensteri, L.quenstedti, L.subalata L. varians, Astacolus anceps, A.aphrastus, A.pauperatus, Vaginulinopsis epicharis, Citharina clathrata, C. aff.C. entypomatus, C. harpula, Vaginulina aff. V. barnardi, V. aff.V. compsa, V. contracta, V. formosula, V. suturalis, Globuligerina oxfordiana. On the basis of these fossil content Early to late oxfordian age has been assigned to this member.

Baisakhi Formation: The shale of the Rupsi member of this formation comprises fauna in the form of foraminifera whereas overlying grey sandy shale comprises ferruginous ocherous nodules enclosing Ammonites. The lower shale bed contains dominantly *Bathysiphon-Rhabdammina-Rhizammina*. It is followed by a simple agglutinated foraminifera fauna belonging to *Trochammina-Reophax-Ammobaculites*. Therefore, Oxfordian to Kimmeridgian age is assigned to this formation.

Bhadasar Formation: This formation represents variety of corals, Nautiloidea and Ammonoidea, including *Haplophragmoides, Ammobaculites* sp. The important palynofossil assemblage of this formation are *Callialosporites, Convertucosis, Impardecispora.* Therefore, Tithonian to Early Cretaceous age is assigned to this formation.

Pariwar Formation: This formation has no typical fossil assemblage but it contains fossil wood, leaf impressions and foraminifera. The fossilized tree trunks belong to *Mesemborioxylon* sp. has been reported. And leaf impression includes *Ptilophyllum acutifolium, Otozamites imbricatus, Taenioptris vittata, T. densinervis T. spatulata, Elatocladus conferta, Pageophyllum sp. Gleichenites sp.* whereas, Foraminifera are present in the form of *Ammobaculities cf. volskiensis, A. greocretaceous, A. cf. incostans erectum, Spiroplectammina cf. dorni, Epistomina cf. tenuicosta* and *Saracenaria cf. fortescosta.* On the basis of discussed assemblage, Neocomian to Aptian age has been assigned to this formation¹².

Habur Formation: This formation comprises Ammonites and Belemnites¹³. The lowermost bed of this formation are rich in Ammonites. However, due to absence of fossils in upper beds of this formation it could not be dated. But, on the basis of fossils in the lower bed Aptian age is assigned to this formation¹⁴.



Figure-2 Tectonic set up of Jaisalmer basin ¹⁶



Figure-3 Geological formations of Jaisalmer basin^{9,13}

Classification of initial scullentary basilis								
Types of basin	Area (sq.km)	Hydrocarbon prospective	Basin / region					
Category 1	518500	Established commercial	Cambay, Assam shelf, Mumbai offshore, Krishna Godavari,					
(7 basins)	516500	production (figure-3)	Cauvery, Assam-Arakan Fold Belt and Rajasthan					
Category 2 (3 basins)	164000	Known accumulation of hydrocarbon but no production as yet	Kutch, Mahanadi- NEC and Andaman Nicobar					
Category 3 (6 basins)	641000	Indicated hydrocarbon shows that are considered geologically prospectively	Himalayan Foreland, Ganga, Vindhyan, Saurashtra, KeralaKonkan-Lakshadweep and Bengal					
Category 4 (10basins)	461200	Uncertain potential which may be prospective by analogy with similar basins in the world	Karewa, Spiti-Zanskar, SatpuraSouth Rewa-Damodar, Narmada, Decan Syneclise, Bhima-Kaladgi, Cuddapah, Pranhita-Godavari, Bastar, Chhattisgarh					
Deepwater	1350000	-	East and west cost from 400 m water depth to EEZ					
Total	3134700	-	-					

 Table-1

 Classification of Indian sedimentary basins¹⁴

Classification of Indian sedimentary basins are described below in Table 1

General stratigraphy of Jaisalmer basin ^{10,14}								
Stratigraphic unit	Formation	Thickness (m)	Age	Depositional environment				
Windblown	Loose sand and alluvial	Highly	Recent	-				
sand/alluvium	material	variable						
Shumar	Dune sand, gravel with	730	Recent to	Fluvial lacustarine eolian				
	ferrufineous nodules		Pleistocene					
Bundah	Foraminiferal	200	Middle Eocene	Marine shelf environment				
	limestone, clays at base							
Khuiala	Shales with limestone beds	400	Lower Eocene	Shallow shelf environment				
	and calcareous silts							
Sanu	Friable sandstone with	670	Paleocene	Continental to marine				
	minor clays							
Parh	Marls and arenaceous	350	Upper	Open marine environment				
	limestone		Cretaceous					
Goru	Sandstone and shale	565	Upper	Overall transgressive with some				
			Cretaceous	regression phase				
Habur	Arenaceous limestone and	200	Lower	Near shore environment				
	calcareous		Cretaceous					
Pariwar	Sandstone and shale	730	Neocomian	Overall regressive phase with some				
				marine incursions				
Baisakhi/bhadasar	Sandstone and shale	730	Upper Jurassic	Near shore to shallow marine				
Jaisalmer	Sandstone and limestone	1130	Middle Jurassic	Low energy environment				
Lathi	Sandstone, shale and	600	Lower jurassic	Continental Fluvial/Fluvio deltaic				
	lignite							
Bhuana	Sandstone, claystone and	707	Permo Triassic	Fluvial to shallow marine				
	shale							
Birmania	Carbonate, dolomitic	2000	Proterozoic to	Marine reducing environment with				
	limestone, shale and		Lower	restricted circulation				
	sandstone		cambrian					
Randha	Calcareous quartzite,	200	Proterozoic to	Continental to near shore				
	sandstone and shale		lower Cambrian					

 Table-2

 General stratigraphy of Jaisalmer basin^{10,14}

Таха	Members yielding corals	Age
Heliocoenia stellata	Badabag Member	Middle Bathonian
Stylina cf. girodi	Badabag Member Fort Member	Middle Bathonian Middle Bathonian
Cryptocoenia hexaphyllia	Fort Member	Middle Bathonian
Isastrea bernardiana	Joyan Member	Upper Bajocian
Isastrea helianthoides	Jajiya Member	Oxfordian
Trochocyathus laminus	Kolar Dungar Member	Upper Tithonian
Craterastraea crateriformis	Badabag Member	Middle Bathonian
Collignonastraea meandra	Badabag Member	Middle Bathonian
Trochoplegma sp.	Fort Member	Middle Bathonian
Periseris cf. elegantula	Badabag Member	Middle Bathonian

 Table-3

 Stratigraphic distribution of corals in the Jurassic strata of the Jaisalmer Basin¹⁶

Goru Formation: Upper Goru are rich in diversified foraminiferal assemblages, which suggests Cenomanian age to this member¹⁵. Whereas, Lower Goru is poorly fossiliferous but consist of different assemblages of planktic and benthic foraminifera in its upper part, which suggests Albanian age to this member¹⁵.

Parh Formation: The upper member of this formaton is represented by rich and diversified foraminiferal assemblages like *helvetoglotruncana helvetica* and *marginotruncana coronata*. Therefore, based upon this Turonian to Santonian age is assigned to this formation¹⁵.

Reference

- 1. SK Biswas, Status of petroleum exploration in India, *proc Indian national science Academy*, (78), 475-494 (2012)
- Dhirendra K. Panday, Shipra Choudhary, Tej Bahadur, Narendra Swami, Dharamveer Poonia and Jingeng Sha, A review of the Lower – lowermost Upper Jurassic facies and stratigraphy of the Jaisalmer Basin, western Rajasthan, India, *Volumina Jurassica*, (X), 61–82 (2012)
- 3. Bhawani singh G Desai and Rajendra Dutt Saklani, Ichno Fabric Analysis of The Tithonia Shallow Mari Sediments (Bhadasar Formation) Jaisalmer Basin, India, *Journal of Earth Systematic Science*,**123(6)**, 1413–1431(**2014**)
- **4.** Bhawani singh G Desai and Rajendra Dutt Saklani, A Preliminary Approach Ichnofabric analysis of theTithonian shallow marine sediments (Bhadasar Formation) Jaisalmer Basin, India, *Journal of Earth Systematic Science*, **123(6)**,1413–1431(**2014**)
- 5. K. Arora, K. Suman, M.M. Dixit, and D. Sarkar, Jaisalmer basin of western Rajasthan: A gravity perspective, *Search and discovery article*, (2011)

- Shyam N. Mude, Suyog A. Jagtap, and P. Kundal, Search for Generic Provenance and Petrographic Evolution of Sandstones, Bhadasar Formation (Middle Jurassic), Jaisalmer Basin, Rajasthan, India, *International Journal of Advanced Earth Science and Engineering*, (3),114-121 (2014)
- 7. Jai Krishna, An overview of the Mesozoic Stratigraphy of Kachch and Jaisalmer Basin, *Journal of Paleontological Society of India*, (32),136-149 (1987)
- Atul khatri, Parth Chauhan, P.L Srinivasa Rao, P.h. Rao, Hydrocarbon prospectivity of indian sedimentary basins-a review, *International Journal of Scientific Research*, (4), 2277-8179 (2015)
- Neeraj srivastave, Tribhuvan Singh Ranawat, An overview of yellow limestone deposits of the Jaisalmer basin, Rajasthan, India, *volumina Jurassica*, XIII(1), 107-112, (2015)
- Dhananjai Verma, G.N. Jadhav, T.K. Biswal, S.K. Jena and N. Sharma, Characterization of hydrocarbon-bearing fluid inclusion in sandstones of jaisalmer basin, rajasthan, *Journal of Geological Society of India*, (80), 505-514 (2012)
- Abu Talib, Gagnesh Upadhyay and M. Haseen, Jurassic Foraminifera from Jajiya Member, Jaisalmer, Formation, Western Rajasthan, *Journal of Geological Society of India*, (83), 38-46 (2014)
- Jyotsana Rai1, Abha Singh and Dhirendra Kumar Pandey, Early to Middle Albian age calcareous nannofossils from Pariwar Formation of Jaisalmer Basin, Rajasthan, western India and their significance, *Current Science*, (105) 11 (2013)
- **13.** Sreepat Jain and Rahul Garg, Biostratigraphic implications of the record of genus himalayites From the late tithonian

sediments of jaisalmer, western India, *Journal of the Palaeontological Society of India*, **57(2)**, 105-111 (**2012**)

- **14.** Directorate General of Hydrocarbons (DGH), website: http://www.dghindia.org (**2011**)
- **15.** Jagmohan Singh and K.K. Nayak, Cretaceous Sequences and their Chronostratigraphic Correlation in Western Part of Jaisalmer Basin, *AAPG Search and Discovery* (**2011**)
- Dhirendra K. Pandey, Franz T. Fürsich and Rosemarie Baron-Szabo ,Jurassic corals from the Jaisalmer Basin, western Rajasthan, India, *Zitteliana* (A48/49),13-37 (2009)