CHAPTER - II

LITERATURE REVIEW

GENERAL

The Mesozoic sedimentary sequence in Rajasthan has been studied in the past by a large number of geologists, stratigraphers, palaeontologists and academicians, who have tried to understand the sequence from different points of view. The study of the Jurassic rocks in particular, has been carried out by the university research students, petroleum geologists as well as by the professional palaeontologists of the Geological Survey of India and the Oil and Natural Gas Commission. The main highlights of their contributions, which are essential to provide a suitable background for the present investigation, are broadly summarized in the following aspects.

STRATIGRAPHICAL INVESTIGATIONS

Blandford (1877), was the first worker who identified the various rock types of the Mesozoic sequence in western Rajasthan and divided the sequence into the three broad groups-

a) Ammoniferous beds of Kuchri,

b) Jaisalmer Limestone and Sandstone, and

c) Balmir sandstone.

However, the systematic mapping of the exposed sections was not done by him.

Oldham (1886, 1888) was the first to demarcate different stratigraphic units in western Rajasthan and he prepared a geological map for a part of the area on 1 : 3, 16,800 scale. Based on faunal evidences, he divided the stratigraphic units into six formations viz.

- Eocene
- Abur group
- Parihar Sandstones
- Bedesir group
- Jaisalmer Limestone
- Balmir Sandstone,

Oldham (op.cit) correlated the Jaisalmer Limestones with the Chari Group, the Bedesir Sandstone with the Katrol Series and the Parihar sandstones with the Umia beds of Kutch.

The area was re-examined by La Touche and later on he mapped parts of the area covered by survey of India sheet numbers 40 N. The fossil fauna, especially the cephalopods of the area, were first studied by Spath (1927-33). The assignment of geological ages to the various stratigraphic units distinguished by Oldham

had been made possible by Spath's identification of the ammonites. The thickness of the different stratigraphic units of Jurassic sediments of Jaisalmer area were measured systematically by Allison (1939) of the Burma Oil Company (cit. in Arkel, 1956).

Swaminathan et.al., (1956,1959) of the Geological Survey of India have, in the course of their geological traverses over large parts of the Jaisalmer district, slightly modified Oldham's classification. They distinguished a set of beds between the top of Jaisalmer Formation and the Bedesir basal grits, and classified them as the Baisakhi Formation which was originally included in the Bedesir Group of Oldham. The old name Jaisalmer was retained by them for the beds above the Lathi upto the top of the Kuldhar Oolite

Table : II.1 : Stratigraphic succession in Jaisalmer Basin (modified after Swaminathan et. al 1959.)

Geological age	Formation	Thickness in metres
Cretaceous	Abur	60
	Unconformity	
	Parihar	300
	Bedesir	65

Geological age	Formation	Thickness in metres
Jurassic	Baisakhi	165
	Jaisalmer	150
	Lathi	450
----------	Unconformity	----------
Triassic	Unexposed	
----------	Unconformity	----------
Permo-Carboni-ferous	Badhura Bap Boulder beds and spread	30-250
Precambrian	Malani Igneous suite of rocks (?)	

Narayanan (1964) after detailed mapping of the area, divided the Jurassic sediments into Lathi, Jaisalmer, Baisakhi and Bedesir formations, and compiled the characteristic fossils of respective formations.

The general stratigraphic succession of Jaisalmer area has been worked out by the geologists of the Geological Survey of India and the Oil and Natural Gas Commission and has been compiled by Krishnan (1982), as shown is Table II.2.

Singh and Jaikrishna (1969), have given a chronostratigraphic status to the Jaisalmer unit as a series comprising of three stages,

namely, the Jaisalmer, the Kuldhar and the Rupsi stages in ascending order. Later, Jaikrishna (1980) transferred the Rupsi stage from the Jaisalmer Series to the Bhadasar Series while giving a geological map of the area. Accordingly, the Jaisalmer Series is confined to the two lower stages.

Table II.2 Post - Palaeozoic succession in western Rajasthan (modified after Krishnan, 1982).

Formations and Thickness	Lithology and Fauna	Age
Bandah and Khuiala Beds (50m ?)	Dense siliceous limestone with fuller's earth and clay containing nummulites, pelecypods, gastropods, echinoids	Kirthar and Laki
Abur beds (60-90m)	Limestones, subordinate grits, clays and shales containing pseudohaploceras and other ammonites	Aptain
Parihar sand	Unfossiliferous, ferruginous and feldspathic sandstone and quartzites, overlapped in places by Eocene.	Early Cretaceous

Formations and Thickness	Lithology and Fauna	Age
Bedesir Beds (119-300m)	Ferruginous sandstone and grits with ammonites.	Late Jurassic
Baisakhi Beds (600m)	Sandstones and shales, gypseous Lower beds are fossiliferous.	Oxfordian Kimmeridgian
Jaisalmer Limestone (160m)	Buff to yellow oolites and shell limestones and calcareous sandstone.	Callovian - Oxfordian.
Lathi Beds (330m)	Sandstones with some layers of limestone in the upper part with molluscan and wood fossils.	Early Jurassic

Mesozoic-Tertiary stratigraphy of the Jaisalmer Basin has been reviewed by Dasgupta (1973, 1975). Different Lithostratigraphic units of Jurassic sediments have been identified by him on the basis of lithological association and geological field investigations. Detailed litho-units of Jurassic sediments identified by Dasgupta (Op. Cit), are listed in Table II-3.

Kachhara and Jodhawat (1981), on the basis of faunal evidence, proposed a six fold classification of the Jaisalmer Formation. The new

TABLE II.3 SHOWING GENERAL MESOZOIC STRATIGRAPHY OF JAISALMER AREA

(Modified after Das Gupta, 1975).

Age	Formation	Member	Gross Lithology and Facies
Aptian	Habur		Marine coquinoidal limestone and sandy limestone
	Unconformity		
Cenomanian	Pariwar (350m)		Sandstone and shale alternations with plant fossils and fossilised tree trunks.
Portlandian	Bhadasar (85 m)	Mokal Kolar-Dungar	Coarse to finegrained sandstone, marine in the lower part grading into nonmarine sequence at the top.
Kimmeridgian	Baisakhi (250 m)	Rupsi Ludharwa Baisakhi	Marine shale alternating with sandstone and ammonites.
	Unconformity		
Oxfordian to Callovian	Jaisalmer (400 m)	Kuldhar Badabag Fort Joyan Hamira	Alternations of marine arenaceous limestone and calcareous sandstone with fossiliferous oolite bed at the top.
	Gradational contact		
Bathonian to Lias	Lathi (350m)	Thaiyat Odania	Terrestrial to (?) deltaic sandstone with fossil wood and fossilised tree trunks
Triassic	Shumarwali		
Precambrian	Metamorphics and Igneous rocks		

member, named as Jajiya was originally a part of Kuldhar Member (of Dasgupta, 1974).

Pareek (1981) emphasized the configuration of the Jaisalmer basin while describing the geology of western Rajasthan. He correlated the stratigraphic sequences of western Rajasthan with those of Kutch mainland and the Indus Basin while establishing a regional tectonic and basinal setup.

Datta (1983) has synthesized the geologic information and evaluated the hydrocarbon prospects of Jaisalmer Basin. According to him, the Jaisalmer Basin is considered to be a potential hydrocarbon bearing basin having a prognostic reserve of 150 MMT of oil or oil equivalent gas.

PALAEONTOLOGICAL STUDIES AND GEOLOGICAL AGE

Oldham (1893) correlated the Jaisalmer Formation with the Group of Kutch and assigned it an Early Callovian to Oxfordian age range, based on taxa including **Terebratual biplicata** Swerby, **T.Intermedia** Sowerby, **Trigonia Costaba** Swerby, **Pecten lens** Swerby, **Nautilus Kumaguense,** Waagen and **Ammonites (Stephanoceras) firsus** Sowerby.

Spath (1933) identified the ammonites collected by Gn. Skinner from the Jaisalmer Formation and correlated the sediments of the Middle and Late Chari Group of Kutch with Dhosa oolites at the top.

Varma (1960) studied the leaf impressions collected from the Lathi Formation in the neighbourhood of Devikot. Srivastava (1960), as quoted by Narayanan et. al., (1961), examined the microflora in subsurface samples collected from tubewells drilled by the Exploratory Tubewell Organisation (Govt. of India), yielding a rich assemblage, and representing the plant groups Pteridophyta, Cycadophyta and Coniferales.

Micropaleontological study of Jaisalmer Formation had been initiated by Lubimova, Guha, Mohan (1960) and Subbotonia, Datta and Srivastava (1960). They have worked out the ostracods and foraminifers respectively. On the basis of these fauna, they have assigned an Oxfordian age to the Kuldhar Member and a Callovian age to Badabag Member. Singh and Jaikrishna (1969) have studied the bivalve genera and echinoid species from these sediments and assigned them a Bathonian to Middle Callovian age. Bhatia and Mannikeri (1976) have described a new foraminiferal species viz. Sporobulimina rajasthanensis from the Fort Member and considered it to be of Callovian-Oxfordian in age.

Kachhara and Jodhawat (1981), on the basis of bivalves and ammonoids, inferred an age to Jaisalmer Formation. On the basis of foraminiferal study, the biostratigraphy of Kuldhar stage (upper part of Jaisalmer Formation) has been worked out by Kalia et. al. (1983).

In addition to the study of microfauna, the study of the microflora of the area was attempted by Srivastava (1966) and Lukose (1977).

Recently, fossil dinosaurian bones have been recorded from the Middle Jurassic of Jaisalmer Formation (Callovian) in the Jaisalmer basin, Rajasthan (Mathur et. al., 1985).

Hietermann (1957), as quoted by Narayanan et, al., (1960, 1961) has recovered some microfauna from the Baisakhi beds and assigned them an upper Jurassic (Sequanian-Kimmeridgian) age.,

Megafossils comprising brachiopods, pelecypods, gastropods and cephalopods collected from the Bhadasar sequence by ONGC geologists and identified by Singh and Khanna (1959), suggested an Upper Jurassic age for this formation. Spath (1927-33, 1933), as quoted by Narayanan et. al., (1961), assigned a Portlandian to Tithonian age to this formation.

SEDIMENTOLOGICAL INVESTIGATIONS

Although, a fairly detailed account on the stratigraphy and palaeontology of Jurassic sediments is now available, very little work has been done to synthesize the geological information towards the reconstruction of the palaeoenvironment and depositional history through detailed sedimentological and petrographical studies.

Pandey et. al. (1987, 88) carried out petrographical and textural studies of Cretaceous sediments and sediments of the Jaisalmer Formation from selected sub-surface sections in the Mari-Jaisalmer Arch area, in order to evaluate their depostitional environment. However, detailed mineralogical, geochemical and surface textural analysis were not taken up.

Apart from the general trends of stratigraphy, palaeontology and palynological studies of Mesozoic sediments, very few workers have diverted their attention to touch the other aspects of geology. For a better understanding of stratigraphic and sedimentation pattern, detailed sedimentological studies including petrographic, geochemical and surface textural analysis of the sediments is necessary. In the present work, an attempt has been made to co-ordinate the geological investigations with petrographic and micro-facies studies of the clastic and carbonate sediments, aided by textural, mineralogical, morphological and geochemical analyses, in order to reconstruct the depositional environment and sedimentation pattern of the Jurassic sediments in the Jaisalmer Basin, western Rajasthan.