CONTRIBUTION TO THE AGE DETERMINATION OF THE NAJMAH FORMATION, FROM SURFACE OUTCROPS IN THE IRAQI WESTERN DESERT

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ABSTRACT

The Najmah Formation was known only from subsurface sections in Iraq. But, the regional and detailed geological surveys in the Iraqi Western Desert revealed its presence as surface outcrops, widely distributed along the Eastern and Northeastern rims of Rutbah Uplift. It extends from east of Rutbah to about 140 Km, crossing Wadi Amij, and then northeastwards crossing Wadi Hauran near Qasir Muhaiwir. Lithologically, the Najmah Formation consists of two parts. The lower part consists of clastics, whereas the upper part consists of carbonates.

Fauna like: *Clypeina jurassica* FAVRE, *Calponella* sp., *Conicospirillina basiliensis* MOHLER, *Salpinoporella selli (CRESENTI)*, *Coscinoconus alpinus* LEOPOLD, *Kurnubia palastiniensis* HENSON, *K. wellingsi* HENSON, *Haurania deserti* HENSON, *H.amiji* HENSON, *Pfenderina trochoidea* SMOUT, *Valvulina jurassica* HENSON and P*rotoglobigerina* sp. are present and are indications of Late Jurassic (Malm) age. The exposed sequence indicates deepening upward cycle starting with shoreline facies and ending with middle shelf facies.

تحديد عمر تكوين النجمة من التكشفات السطحية، في الصحراء الغربية العراقية

بثينة سلمان الجبوري و ساهرة عبد الكريم

المستخلص

كان تكوين النجمة معروفاً فقط في المقاطع تحت السطحية في العراق. إلا أن المسوحات الجيولوجية الإقليمية والتفصيلية أظهرت بأن تكوين النجمة يتكشف شرق مدينة الرطبة ويمتد شرقاً إلى 140 كم قاطعا وادي عامج ثم يمتد باتجاه الشمال الشرقي ليقطع وادي حوران قرب قصر محيور. يتكون تكوين النجمة صخارياً من جزئين: الأسفل يتكون من فتاتيات، بينما الجزء الأعلى يتكون من صخور كلسية ودولومايتية.

أوضحت الدراسة تواجد المتحجرات الدالة على عمر الجوراسي المتأخر مثل:

Clypeina jurassica FAVRE, *Calponella* sp, *Conicospirillina basiliensis* MOHLER, *Salpinoporella selli (CRESENTI) Coscinoconus alpinus* LEOPOLD *Haurania deserti* HENSON, *H.amiji* HENSON, *Kurnubia palastiniensis* HENSON, *K. wellingsi* HENSON, *Pfenderina trochoidea* SMOUT, *Protoglobigerine* sp. and *Valvulina jurassica* HENSON

وإن التتابع المتكشف يمثل دورة تعمق نحو الأعلى تبدأ من سحنة الساحل وتنتهي بسحنة وسط الرف.

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INTRODUCTION

This study concerns with the age determination and areal distribution of Najmah Formation in the Western Desert of Iraq. The studied area is situated between Latitude 32° 00' and 33° 50' N and Longitude 41° 00' and 41° 50' E (Figs.1 and 2). The work includes results of micropaleontological and field study by the authors. Many new and valuable data were collected mostly based on the occurrences of various microfossils that indicate the presence of the Najmah Formation and it is widely distributed in the Iraqi Western Desert. This contradicts with the previous ideas about its absence as surface outcrops, in the Iraqi Western Desert (Bellen *et al*., 1959; Buday, 1980 and Hassan, 1998).

PREVIOUS WORKS

A summarized knowledge on the geology and stratigraphy of the Western Desert of Iraq was published by Bellen *et al*. (1959) and Al-Naqib (1967); most of their results were based on previous unpublished researches of Iraqi Petroleum Company (IPC). According to Bellen *et al*. (1959), the formation is not known from outcrop sections in the Iraqi Western Desert, it is recognized only in subsurface sections. Its type section is in oil well Najmah 29, between drilled depths (4784 – 5902) feet, its lithology is summarized as follows: recrystallized limestone, oolitic and pseudo-oolitic limestone, dolomite or dolomitic limestone with thin anhydrite, chert and arenaceous content present in the carbonate.

Karim and Ctyroky (1981) studied some outcrop sections along the eastern rim of the Rutbah Uplift, which has been described as a new Jurassic cycle by Al-Mubarak and Amin (1983) and Jassim *et al.* (1984). Al-Azzawi and Dawood (1996); Sissakian (2000 and 2002) and Sissakian and Mohammed (2007) considered this cycle as Najmah Formation of Late Jurassic. Karim and Ctyroky (1981); Yousif and Raji (1990) and Karim (1993) recorded the following fauna: *Pfenderina salarnitana* SARTONI and CRESENTI, *Kilianina* sp., *Clypeina jurassica* FAVRE, *Protoglobigerina* sp., *Haurania amiji* HENSON, *H.deserti* HENSON, *Kurnubia palastiniensis* HENSON, *Nautiloculina oolithica* MOHLER, *Pseudochrysalidina* sp. and calcispheres.

Al-Mubarak and Amin (1983) mapped also the Najmah Formation in the Iraqi Western Desert. But, the mapped succession differs from that mapped by Al-Azzawi and Dawood (1996) by one sedimentary cycle. Al-Azzawi and Dawood (1996) divided the formation into two main units according to microfossils content (Figs.3 and 4):

1-Lower Clastic Unit, consists of sandstone and calcareous sandstone with few shell fragments.

2-Upper Carbonate Unit is divided into two subunits:

-Lower Pelloidal – Oolitic Subunit, consists of crystalline limestone, partly oolitic and pelletal clayey limestone. This subunit is rich with foraminifera.

-Upper Dolomitic Subunit, consists mainly of dolomite and marly dolomitic limestone. This subunit is rich in foraminifera and shells of brachiopods, peleycypods and gastropods.

Hassan (1998) denied the presence of the Najmah Formation and considered the succession as part of Muhaiwir Formation. Jassim and Buday in Jassim and Goff (2006) considered part of the Najmah Formation that is exposed in Wadi Hauran as the Saggar Formation, with keeping the other outcrops as Najmah Formation.

THICKNESS

The thickness of the Najmah Formation is 45 m northwest of Kilo 160 area and decreases towards southwest to 24 m and farther southwestwards to 8 m only; then disappears totally along the paved Ramadi – Rutbah road, about 10 Km east of Amij.

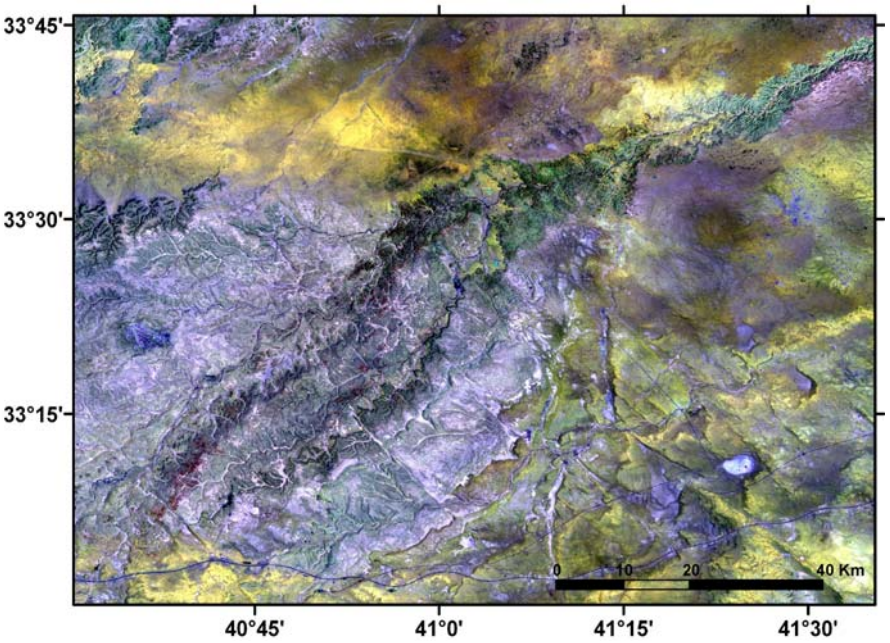


Fig.1: Satellite image of the studied area

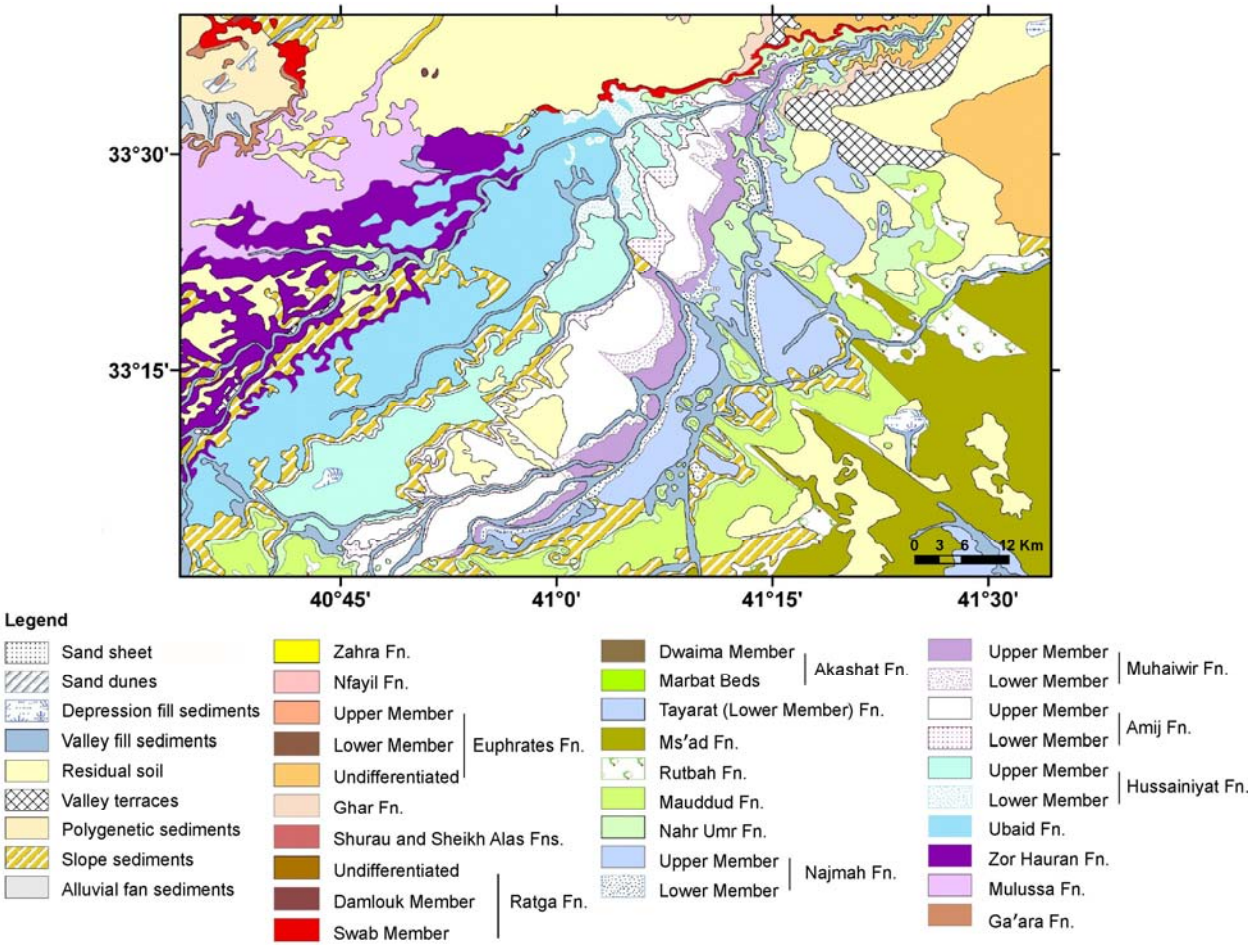


Fig.2: Geological map of the studied area
(after Barwary and Slewa, 1997)

CONTACTS

The Najmah Formation is underlain unconformably by Muhaiwir Formation (Bathonian); the contact is marked by the presence of sandy layers above the carbonates of the Muhaiwir Formation. Whereas, it is overlain unconformably by Rutbah Formation (Cenomanian) and the contact is marked by quartzitic sandstone. In Wadi Mua'isher, it is overlain unconformably by Ghar Formation (Early Miocene) (Al-Azzawi and Dawood, 1996).

BIOSTRATIGRAPHY

The presence of rich microfossils in both subunits (Figs.3 and 4) enabled the authors to define the exact age of the Najmah Formation, i.e. the presence of index species *Clypeina jurassica* FAVRE, *Calponella* sp., *Stilosomilia* sp. (Fig.5.8), *Conicospirillina basiliensis* MOHLER, *Pfenderina trochoidea* SMOUT, *Coscinoconus alpinus* LEOPOLD (Portlandian of Turkey; Azema *et al.*, 1977), *Kurnubia palastiniensis* HENSON, *K. wellingsi* HENSON (Figs.5.4 and 5.5) is an index species of the Cenozone established by SARTONI and CRESCENTI, 1962 (Late Jurassic of South Turkey, Tasli, 2000), *Salpinoporella pygmaea* GUMBEL, *S. selli* (CRESENNTI) (Fig.5.9), *Nautiloculina oolithica* MOHLER (Figs.5.2 and 5.4) (Malm of Somalia, Prestat, 1977), *Protoglobigerina jurassica* HAEUSLER (Fig.5.3), *Pseudochrysalidina* sp. (Figs.5.1 and 5.6) (Late Jurassic of Aquitanian, Carozzi *et al*., 1972). All previously mentioned fauna are correlated with the Late Jurassic of Iran (Bozorgnia, 1964 and Sampo, 1969), East Mediterranean (Kuznetsova, 1996) and South Turkey (Tasli, 2001).

Also abundant occurrence of Middle – Late Jurassic fauna are present in both subunits, i.e. *Haurania amiji* HENSON (Fig.5.7); *H.deserti* HENSON; *Valvulinella jurassica* HENSON, *Textularia jurassica* HENSON, and *Amobaculites corolithiformis* SCHWAGER (Sampo, 1969; Jovicheva and Trifonova, 1974 and Leikine and Vila, 1975). These fossils confirm that the two subunits of Najmah Formation are precisely of Late Jurassic (Malm) age.

CONCLUSIONS

- The microfossil assemblages prove the presence of Late Jurassic (Malm) age, as outcrops in the Western Desert of Iraq and also prove that the sequence belongs to Najmah Formation, due to lithological and paleontological similarities with the type section.
- The formation is found to be widely distributed in the Western Desert of Iraq and it follows the same trend of the Jurassic cycles.
- The recognized Najmah Formation of this study can be correlated lithologically and paleontologically with the findings of Yousif and Raji (1990) and Karim (1993) of subsurface Najmah Formation in the Iraqi Western Desert.

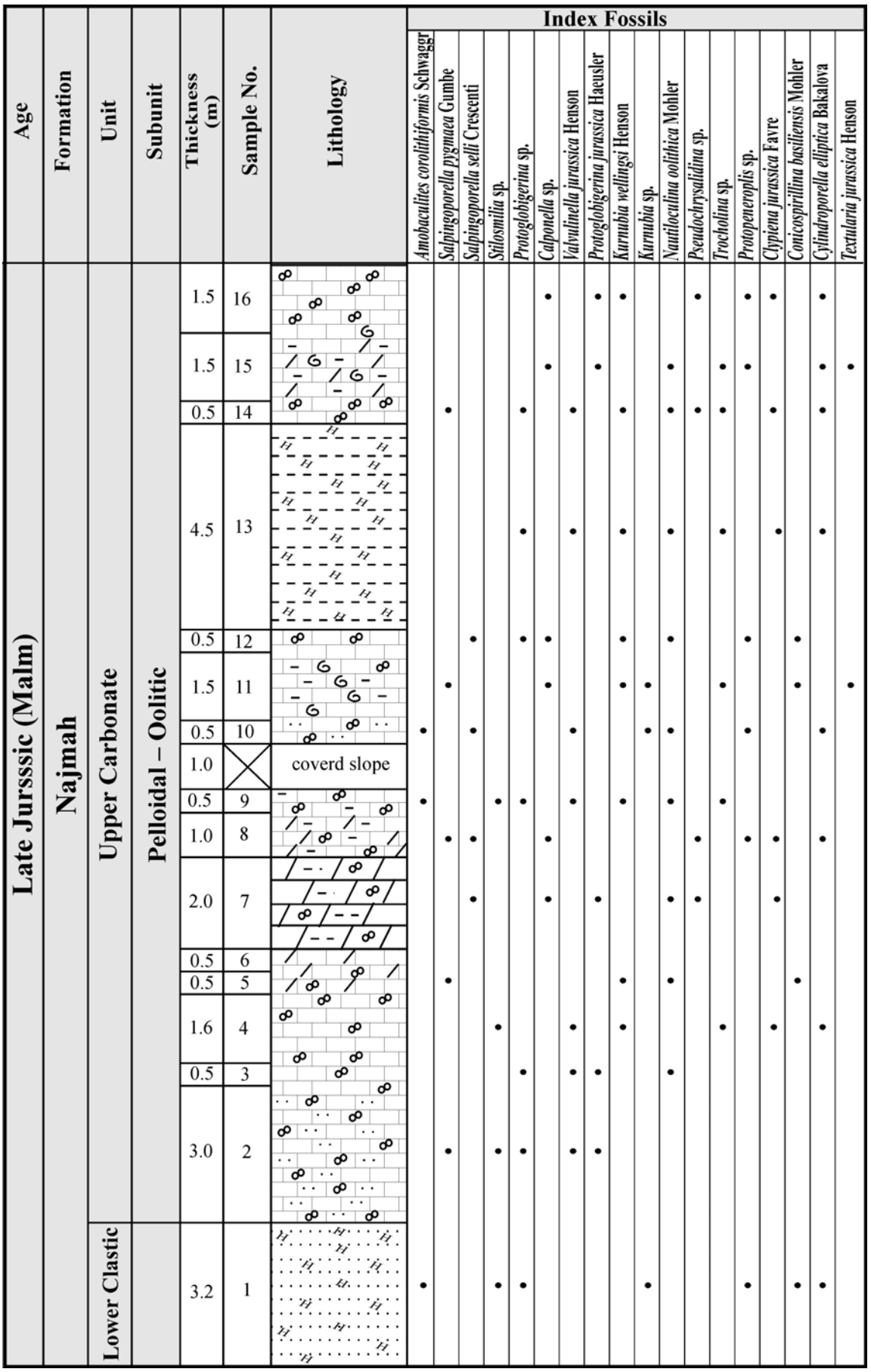


Fig.3: Lithology and fossils distribution in Lower Clastic Unit and Pelloidal – Oolitic Subunit of Najmah Formation

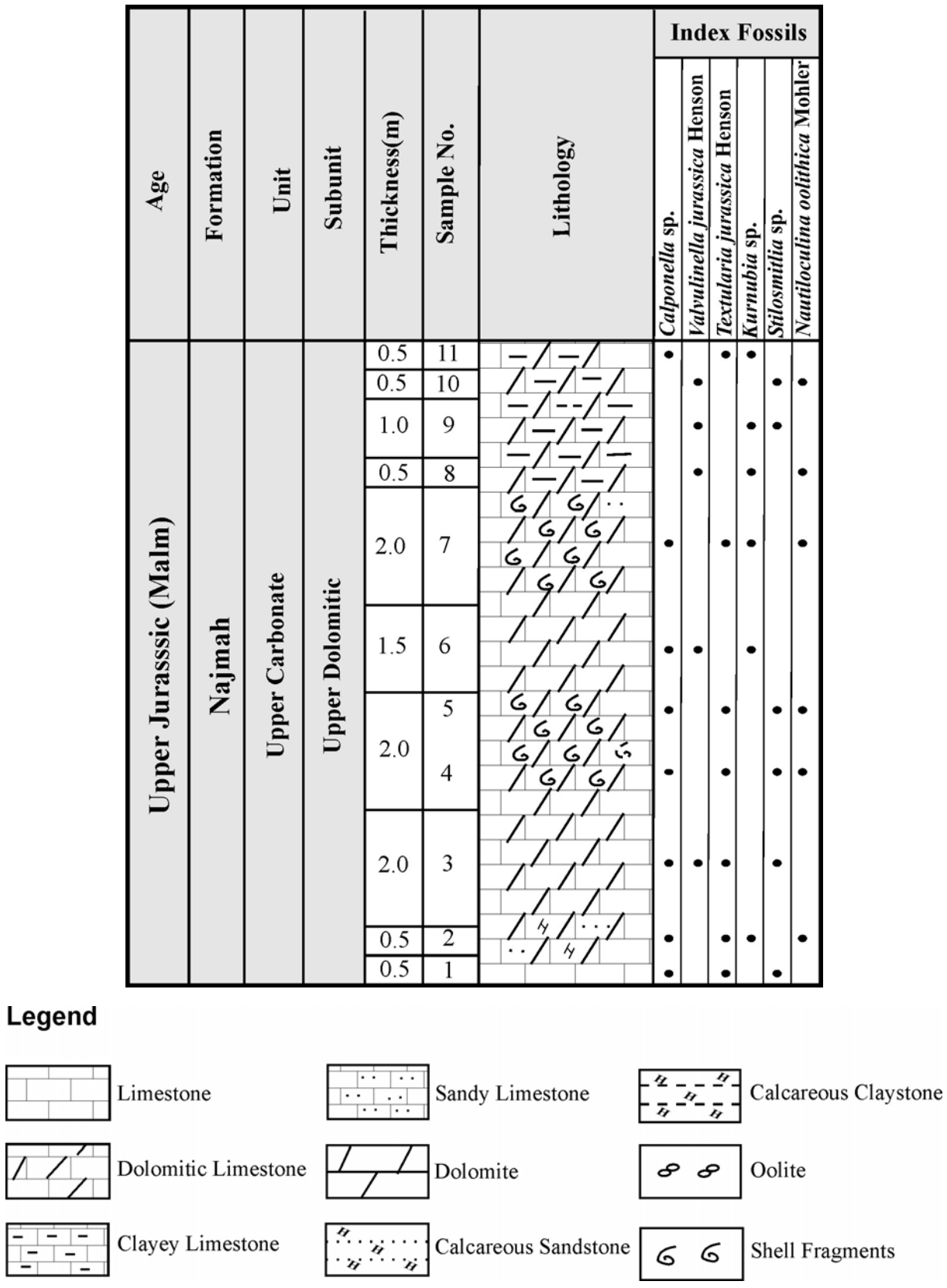
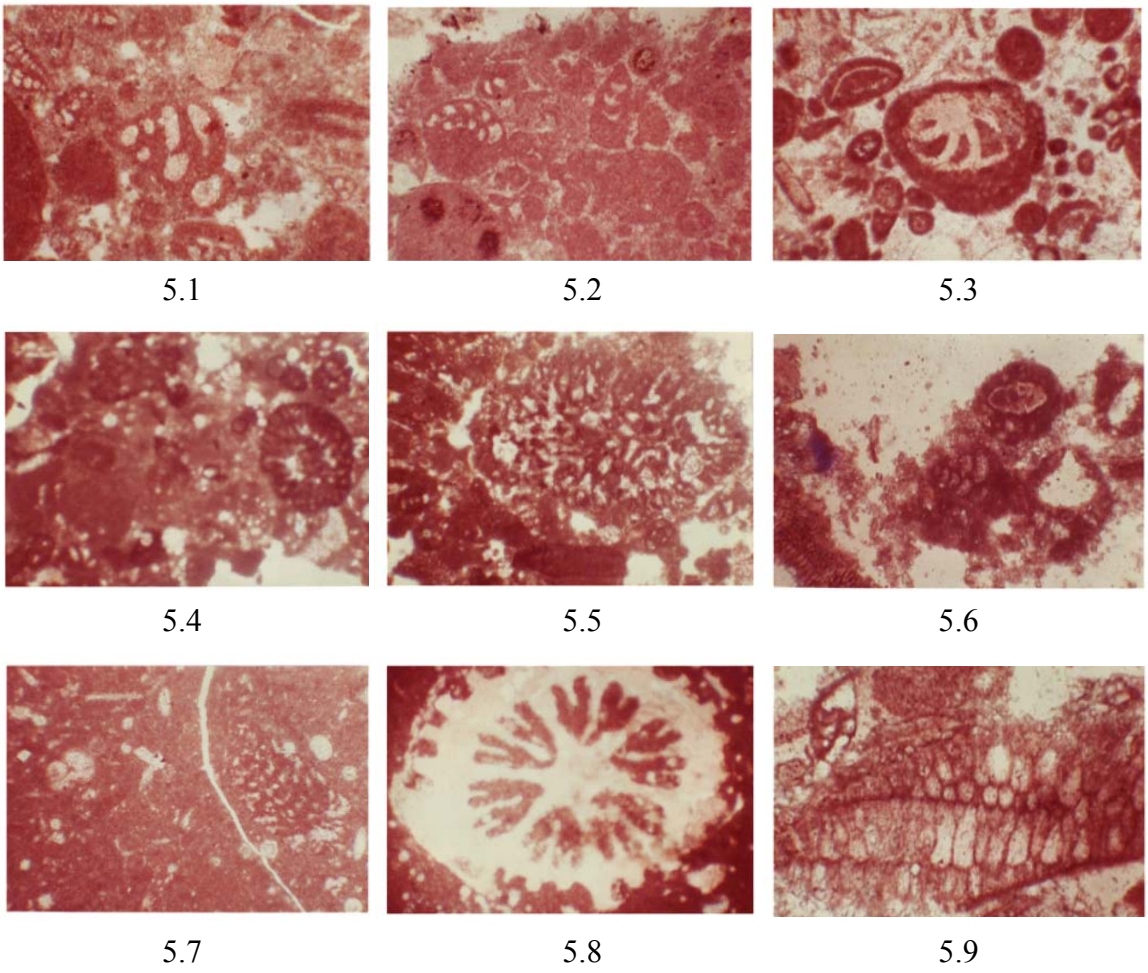


Fig.4: Lithology and fossils distribution of the Upper Dolomitic Subunit of Najmah Formation



5.1 5.2 5.3

5.4 5.5 5.6

5.7 5.8 5.9

5.1: Pelletal biomicrite with *Pseudochrysalidina* sp., calcispheres, echinoid plates and shell fragments, X56

5.2: Pelletal dolomicrite with *Nautiloculina oolithica* MOHLER, and *Trocholina* sp., X80

5.3: Oolitic crystalline limestone with *Protoglobigerina* sp., *Lenticulina* sp. and shell fragments, X80

5.4: Dolomitic biomicrite with *Nautiloculina oolithica* MOHLER, aperture view of *Kurnubia* sp. and calcispheres, X52

5.5: Dolomitic biomicrite with *Kurnubia wellingsi* HENSON, X52

5.6: Pelletal biomicrite with *Pseudochrysalidina* sp., rotalids, X80

5.7: Biomicrite with *Haurania amiji* HENSON, *Nautiloculina oolithica* MOHLER and *Protoglobigerina* sp., X54

5.8: Biomicrite with *Stilosomilia* sp. and calcispheres, X54

5.9: Biomicrite with *Salpingoporella selli* CRESCENTI, X80

Figs. (5.1 – 5.9)

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