PALYNOSTRATIGRAPHY OF THE LOWER CLASTIC UNIT OF HUSSAINIYAT FORMATION (EARLY JURASSIC), WESTERN DESERT, IRAQ

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ABSRTACT

The Hussainiyat Formation is recently added to the stratigraphic column of Iraq, previously it was considered within the Ubaid Formation. The formation consists of two lithologic units: the Lower Clastic Unit and the Upper Carbonate Unit. It is widely exposed in the Iraqi Western Desert, especially in an area extending from east of Rutbah town towards northeast till Muhaiwir vicinity.

This study is an outline of a study being carried out on the palynological analyses and dating of the Clastic Unit of Hussainiyat Formation. A total of forty one assemblages of palynomorphs were identified and discussed from three subsurface sections (65 samples). These assemblages indicated Early Jurassic (Hettangian – Pliensbachian) age for this unit. The palynological data supports the previously environmental interpretations, indicating lacustrine to delta plain conditions to the clastic unit.

بالينوستراتغرافية الوحدة الفتاتية السفلى لتكوين الحسينيات (الجوراسي المبكر) في الصحراء الغربية العراقية

بثينة سلمان الجبوري

المستخلص

إن تكوين الحسينيات قد أضيف حديثاً إلى العمود الطباقي للعراق، وسابقاً كان يعتبر جزءاً من تكوين العبيد. يضم تكوين الحسينيات وحدتين صخاريتين هما: الوحدة الفتاتية السفلى والوحدة الكاربونايتية العليا. يتكشف تكوين الحسينيات بشكل واسع في الصحراء الغربية العراقية، وخاصة في مناطق شرق مدينة الرطبة وباتجاه الشمال الشرقي وصولاً الى منطقة المحيور.

تتناول الدراسة الحالية تحديد العمر والبيئة الترسيبية للوحدة الفتاتية السفلى لتكوين الحسينيات بدليل التحليل البالينولوجي. تم تحديد 41 نوعاً من البالينومورفات (حبوب الطلع) من 65 نموذج لثلاثة مقاطع تحت سطحية. حددت هذه الأنواع عمر الجوراسي المبكر (Pliensbachian – Hettangian) للوحدة الفتاتية السفلى لتكوين الحسينيات. أثبتت التحليلات البالينولوجية للمقاطع الثلاثة ظروف بحيرية ودلتاوية لترسيب الوحدة الفتاتية.

INTRODUCTION

The Hussainiyat Formation is recently added to the stratigraphic column of Iraq (Al-Mubarak and Amin, 1983 and Jassim *et al*, 1984). It is exposed along wadi Hussainiyat, starting from 42 Km east of Rutbah town and extends northeastward in a narrow belt, with width of (3 – 12) Km and pinch out in wadi Hauran, 6 Km northeast of Qasir Muhawir (Fig.1).

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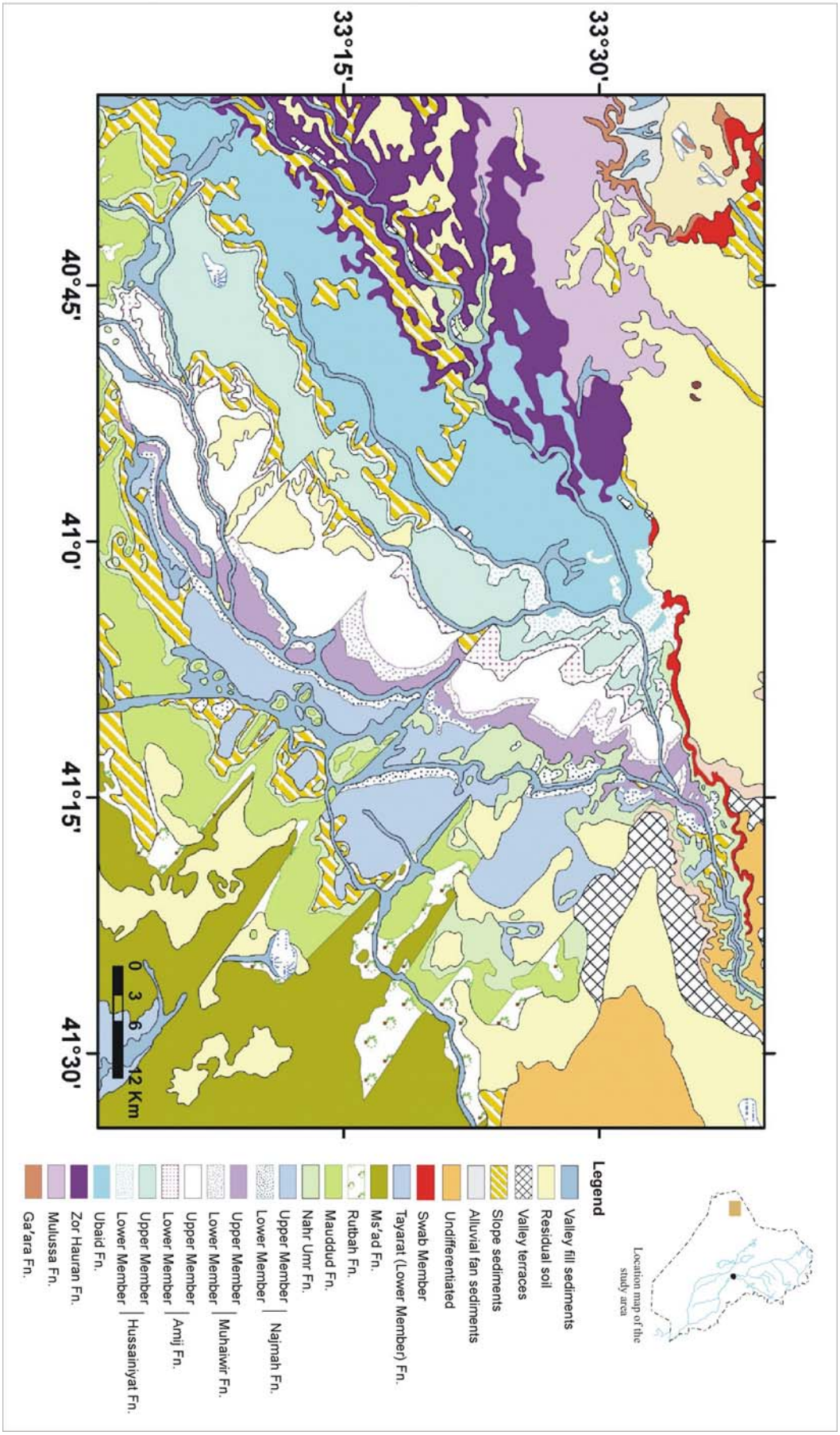

Fig.1: Geological Map (after Barwary and Slewa, 1997)

Al-Mubarak and Amin (1983) and Al-Azzawi and Dawood (1996) divided the Hussainiyat Formation into two units:

- **Lower Clastic Unit** consists of cyclic sequence of sandstone, clayey sandstone, silty claystone and claystone, with common reddish brown color.
- **Upper Carbonate Unit** is subdivided into two subunits:
  - **Clastic – Carbonate Subunit** consists of alternation of dolostone, sandy dolostone and dolomitic limestone.
  - **Carbonate Subunit** consists of crystalline dolostone, dolomitic limestone, with pelecypods at the uppermost part.

Paleontologically, all the previous studies dealt with the Upper Carbonate Unit of the Hussainiyat Formation. Buday and Hak (1980) reported the plant genus Cycus. Karim and Ctyroky (1981) recorded small gastropods, pelecypods, ostracods and algal stromatolites and they suggested Lias age, being deduced mostly from stratigraphic position.

Hassan (1984) mentioned that the formation is rarely fossiliferous, the fauna are restricted mainly to the lower part of the Carbonate Unit, and many species of bivalve fauna are described. The majority of the fauna suggested Bajocian age for the Hussainiyat Formation.

The present study deals with the Clastic Unit of Hussainiyat Formation to evaluate the age and depositional environment using palynological analysis.

PALYNOSTRATIGRAPHY

▪ Palynological Preparation

Sixty one samples were collected from three subsurface sections located within the northern part of Hussainiyat area, east of Rutbah, Western Desert (Fig.1). These samples were processed for palynological analysis using the standard techniques (Bars and William, 1977 and Travers, 1988).

Two to three slides for each sample were prepared, usually about (100 – 300) palynomorphs have been counted from each sample, some samples (B.H. 19/17) were poor and yielded insufficient number of grains for counting palynomorphs sum of 100, so they were regarded as very poor samples.

▪ Palynostratigraphy of the Clastic Unit

Forty one assemblages of palynomorphs were identified. They are listed bellow in alphabetical order, some taxa proceeded by an asterisk are age indicators (Fig.2):

***Apiculatisporites ovalis* (Nilsson) Norris**
**** Artrisporites minimus* Schulz**
**** A. saturnii* (Thierg) Madler**
***Asteropollis* sp.**
**** Calmaspora tener* (Leschik) Madler**
***Callialasporites dampieri* (Balme) Dev**
***Callialasporites* sp.**
**** Cerebropollenites macroverrucosus* (Thiergart) Schulz**
**** Chasmatosporites apertus* Nilsson**
**** C. hians* Nilsson**
**** Chasmatosporites* sp.**
**** Clavatipollenites hughesii* (Couper) Schulz**
***Concavisissporites variverucatus* (Couper) Brenner**
**** Corollina torosus* (Reissinger) Cornet and Traverse**
**** Deltoidospora toralis (*Leschik) Lund**
***Densoisporites scanicus* Tralaus**

*** *Enzonalasporites* sp.**
** *Faveotriletes scanicu*Tralau**
*** *Intrapuntisporites toralis* (Leschik) Lund**
*** *Kekryphalospora distincta* Fenton and Riding**
** *Lycospora salebrosacea* (Maljavkina) Schulz**
** *Levigatisperites dubius* Nilsson**
** *Levigatisporites* sp.**
*** *Pinuspollenites minimus* (Couper) Kemp**
** *Polypodiisporites polymicroforatus* (Orlowska -Zwolinska) Lund**
*** *Protoconiferus funarius* (Bolck) Pocock**
** *Protopinus scanicus* Nilsson**
** *Spherispollenites subangulatus* Couper**
** *Spherispollenites* sp.**
** *Sterisporites stereoidea* (Potanie and Venitz) Pflug**
** *Striatella jurassica* Madler**
** *Trachysporites asper* Nilsson**
** *Trachysporites* sp.**
** *Tsugella* sp.**
** *Vitreisporites carigii* Pocock**
** *V. latus* (Madler)**
** *V. pallidus* (Reissinger) Nilsson**

DISCUSSION

Thirteen samples from B.H. 19/17 yielded only few palynomorphs and some fungi, whereas twenty eight samples collected from B.H. 19/18 and B.H. 13 show rich palynomorphs, which are correlated with many studies in different areas as mentioned hereinafter (Fig.3):

The presence of *Calmaspora tener, Vitreisporites pallidus, Deltoidospora torales, Artrisporites minimus, Intrapuntisporites toralis, Chasmatosporites* spp. and *Trachysporites hians,* indicate Hettangian age (Schulz, 1967; Pocock, 1979; Pedersen and Lund, 1980; Brenner, 1986 and Dybkjaer, 1988 and 1991).

Helby *et al*. (1987) suggested Hettangian to Pliensbachian age for *Corrollina torosus* Zone, whereas, Kopplehus (1991); Kopplehus and Nilsson (1994) suggested Pliensbachian age for the *Chasmatosporites* Zone with abundant *Chasmatosporites hians, Chasmatosporites* sp. and presence of *Corollina torosus* and *Kekryphalospora distincta*.

There are many palynomorphs, which not only have long range but also are common to be abundant in most of the examined samples. These are mainly of gymnosperous origin with smooth walled trilet spore referable to Deltoidospora; these associations are typical assemblages encountered in Early Jurassic rocks, in North West Europe (Ainsworth *et al*., 1989).

The assemblages recorded in this study (Fig.4) are well correlated with mentioned previous works, so the age of the Lower Clastic Unit of Hussainiyat Formation is suggested as Hettangian – Pliensbachian (Lias), and well correlated with Karim and Ctyroky (1981); Jassim *et al*. (1984) and Al-Azzawi and Dawood (1996).

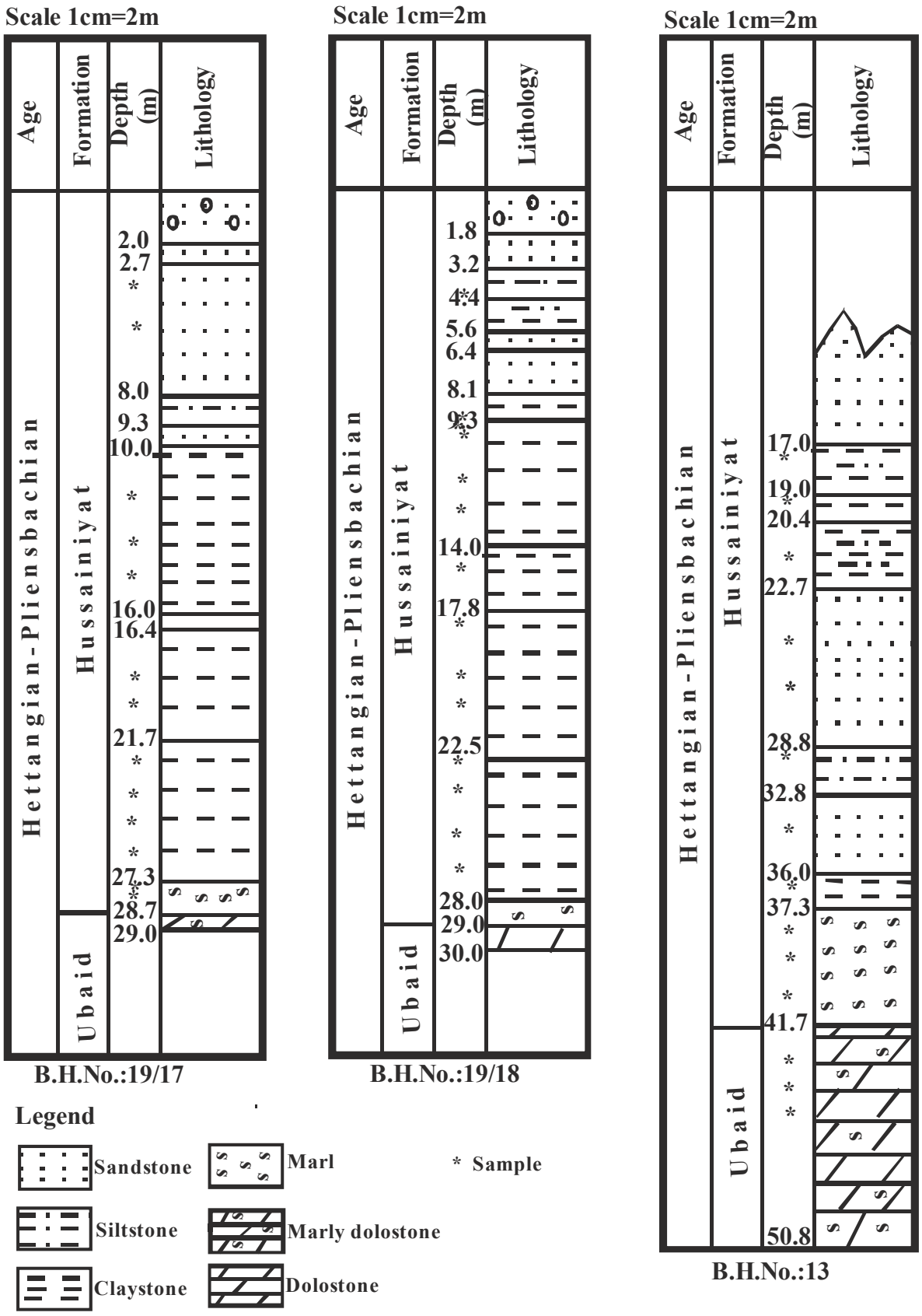

Fig.2: Litholog of the studied boreholes

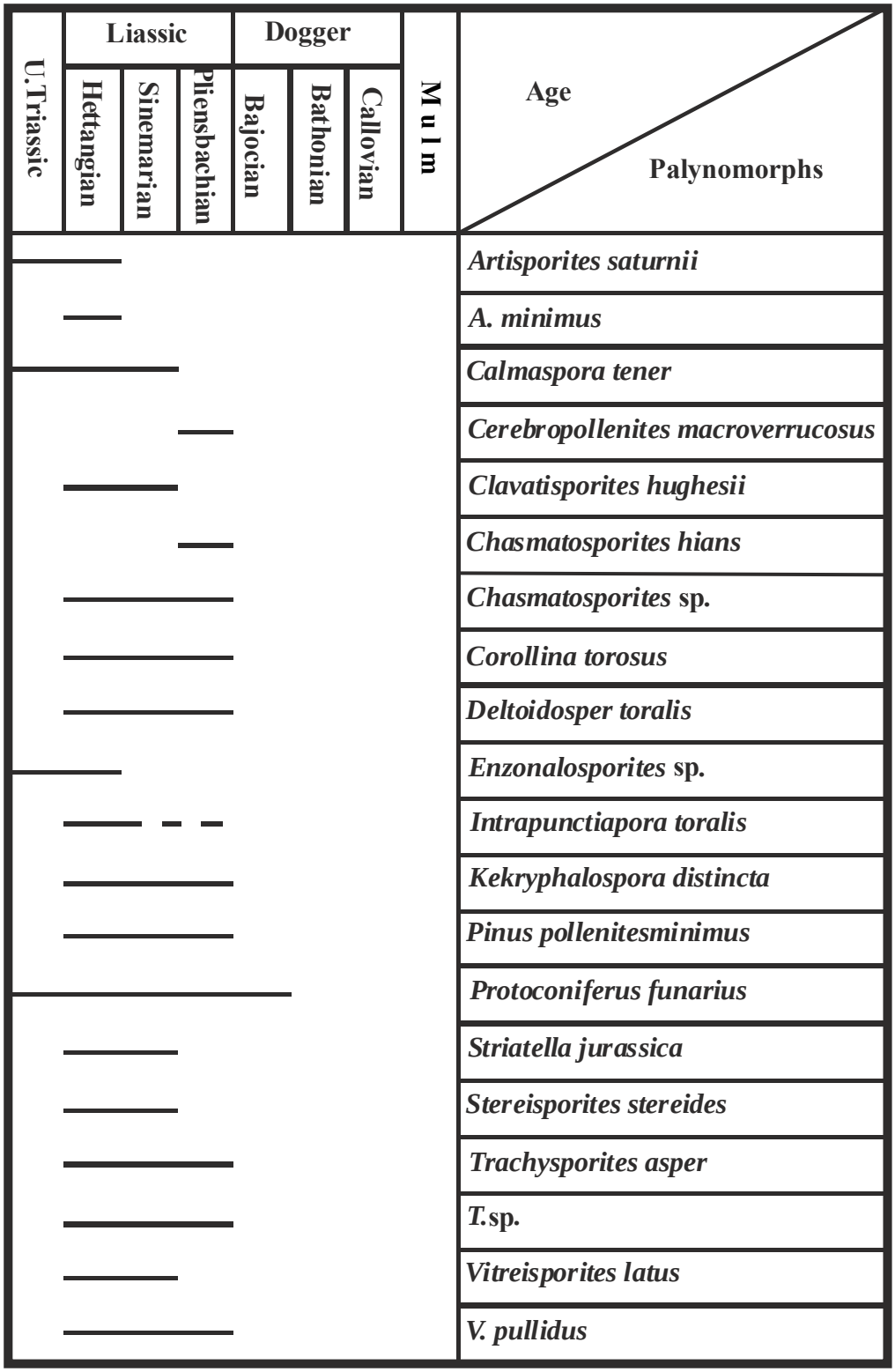

Fig.3: Range chart of index palynomorphs (present study)

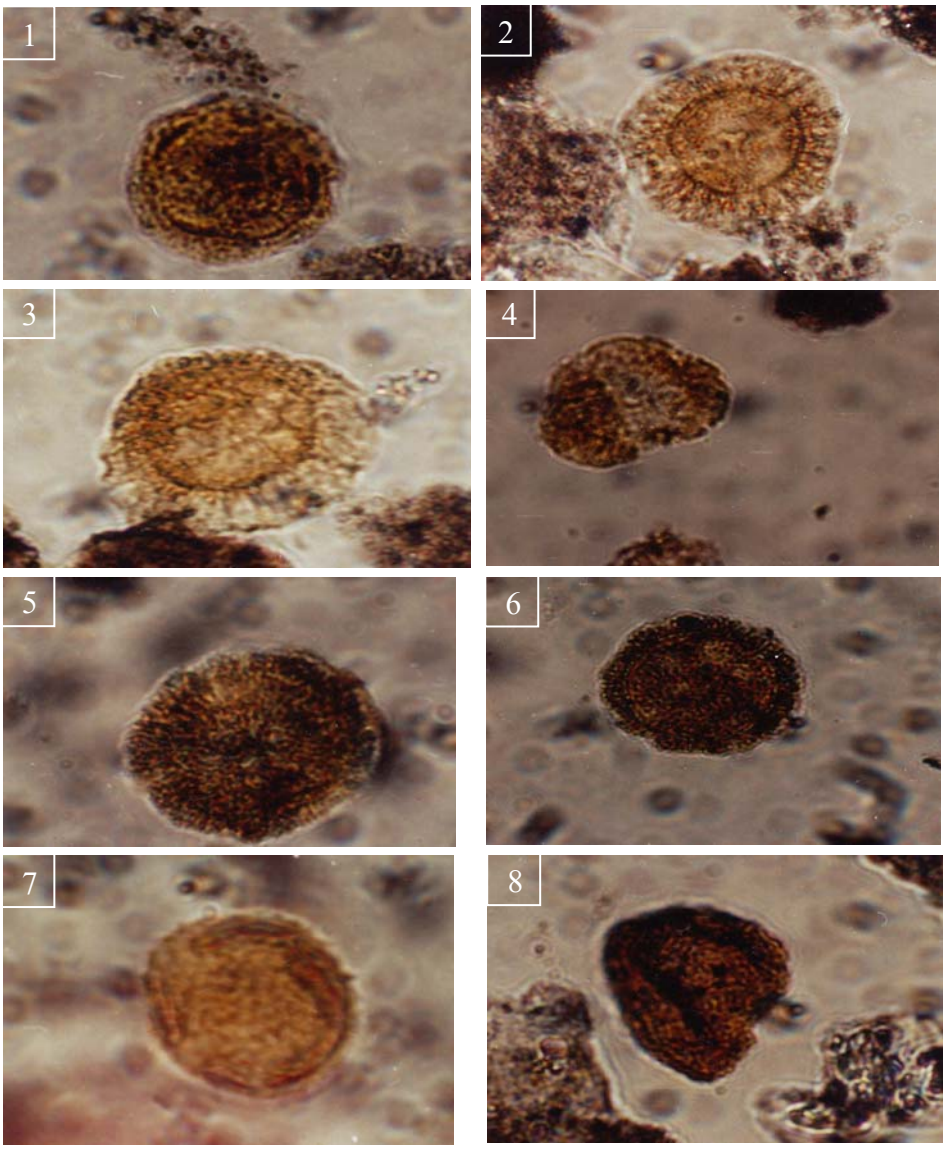

Fig. 4: Index palynomorphs, from the studied samples

1. *Apiculatisporites ovalis* (Nilsson) Norris, B.H. 19/17, depth 22.5 m
2. *Callialasporites dampieri* (Balme) Dev, B.H. 13, depth 35 m
3. *Callialasporites* sp., B.H. 19/18, depth 22.7 m
4. * *Protoconiferus funarius* (Bolck) Pocock, B.H. 13, depth 43.5 m
5. * *Corollina torosus* (Reissinger) Cornet and Traverse, B.H. 19/18, depth 25.3 m
6. * *Enzonalasporites* sp., B.H. 13, depth 25 m
7. * *Cerebropollenites macroverrucosus* (Thiergart) Schulz, B.H. 13, depth 35 m
8. * *Kekryphalospora distincta* Fenton and Riding, B.H. 19/18, depth 25.3 m

PALAEOENVIRONMENT

As indicated in the palynostratigraphy, the palynomorphs could indicate warm and wet climate, especially according to the high occurrence of fungi and plants, which inhabitant in moist forests near river in tropical to subtropical region (Jarzen and Ellsik, 1986 and Barnet, 1989).

The good preservation of the palynomorphs suggests that they were deposited in a low energy environment and in a short distance from or adjacent to the source vegetation. This in turn coincides with the sedimentological evidence of changing from lacustrine conditions to a delta plain environment dominated by fluvial deposits (Philip and Abdul Latef, 1996 in Al-Azzawi and Dawood, 1996). A relative increase in the number of presumed freshwater fungi (B.H. 19/I7) supports this interpretation. This environment correlates well with Jassim *et al*. (1984) and Al-Azzawi and Dawood (1996).

CONCLUSION

This study recorded many assemblages of palynomorphs, which proof the age of the Lowe Clastic Unit of Hussainiyat Formation as Hettangian – Pliensbachian, which coincides with the study of Buday and Hak (1980) and Karim and Ctyroky (1981) for the Upper Carbonate Unit and denied the age recorded by Hassan (1984).

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