Late Jurassic-Early Cretaceous Boundary in Jordan

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ABSTRACT

Late Jurassic *Kurnubia palastiniensis* and *Trocholina palastiniensis* foraminifera embedded in arenaceous biodolomitic micrite and arenaceous biodolomite beds separated by a thin sandy marl horizon of Late Jurassic-Kimmeridgian – Oxfordian-Callovian ages with two new ostracoda species, *Acanthocythere jereshenensis* and *Zerqacythere rummanensis* have been defined from the Upper most Jurassic portion of King Talal Dam Site for the first time in Jordan, which is overlain by a limonitic sandy clay horizon and thick massive white sandstones of Early Cretaceous age.

KEYWORDS: Late Jurassic, *Kurnubia*, *Trocholina*, *Acanthocythere*, *Zerqacythere*, Dier Alla-Zerqa River-King Talal Dam Site, Arda road, Wadi Essabiel, Foraminifera, Ostracoda, Kimmeridgian.

1. INTRODUCTION

Jurassic macrofaunas of Jordan have been discussed by several European geologists namely; Wetzstein (1859), Blanckenhorn (1914), Cox (1925), Muir-Wood (1925), Ionides and Blake 1939, Avnimelech 1945, Arkel 1952, Burdon 1958, Wetzel and Morton (1958), Boom and Lahloub (1962), Jordan (in Bender 1968), Hercogova and Prazak (1972) and Basha and Aqrabawi (1997); whereas the granting age for the Jurassic studies supposed a Kimmeridgian age to the Upper most Jurassic (Libby and Hoskins, 1905), Cox, Muir-Wood, and Ionindes and Blake assigned Bajocian-Bathonian; Douglas (in Ionides and Blake), Bajocian-Bathonian-Callovian; Boom and Lahloub, Aalenian-Lower Bathonian - Bajocian, Wetzel and Morton Rhetic-Bajocian - Bathonian- Callovian; and Basha and Aqrabawi (Lower Part) Bajocian ages.

On the other hand, the microfaunal contents of the Jurassic at Dier Alla - Zerqa River-King Talal Dam and the Arda Road sites have been discussed by Basha (1980; 1983; 1995; 1997), who assigned a Liassic-Aalenian-Bajocian-Bathonian-Callovian-Oxfordian ages for the exposed successions, where non of the previous studies tackled the Jurassic-Cretaceous boundary on the base of the identified macro and microfaunal contents in Jordan.

However, it was Maync (1966) who discussed the boundary on the base of microfaunas identified from several exposed sections, boreholes, cores, and cuttings of Israel. He pointed out that the Kurnub Early Cretaceous sandstone unconformably overlies the carbonatic marls of Late Jurassic sequences depending on the identified foraminifera and ostracoda representatives from the Middle East (Henson, 1948), and Europe (Oertli in Maync, 1966) as clues or criteria for indicating Upper Oxfordian age. It was supported by; *Ammobaculites plexus coprolithoformis*, *A. braunsteini*, *Nautiloculina circularis*, *Iberina praelusitanica*, *Pseudocyclammina jaccardi*, *Kurnubia gr. Palastiniensis*, *Verneuilina minute*, *Gaudryina aff. richteri*, *Paleogaudriyina varsoviensis*, *Brotzenia gr.parastelligera*, *B. gr. mosquensis*, *Spirillina polygyrata*, *S.minima-tenuissima*, and; *Cytherella index*, *Schularidea*? n.sp., *Orthonotacythere sp.2*, *Aparichotocythere cf. compressa*, and *Procytheridea aff. gublerae*, which are equivalent to Halutsa formation. Also, Picard and Hirsch (1987: 39-41) summarized Gill’s study on the Jurassic-Early Cretaceous boundary at the Hamaktesh Hagatan, southern Israel (1965) and places Eligms cf. aualites (Stefanini) in the Callovian age which agrees with Goldberg lithostratigraphic subdivisions (1970).

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2. STRATIGRAPHY

The writer has sampled and measured the upper portion of the Jurassic sequence of the King Talal Dam Site (N: 177.500, E: 226.250) which is closely similar to the Arda road site (N: 172.500, E: 210.750) and the sequence of Wadi Essabiel, west of Amman and Mahis Village (N: 155.000, East: 220.000). Consequently, the upper portion of the stratigraphical succession at the King Talal Dam Site is described as follows:

Upper most Jurassic samples from bottom to top, Sample No. J3: Marly limestone; light gray, biomicritic, dense, compacted, dolomitic, hard, 8m. thick with very badly preserved microfaunas.

Sample No. J2: Marl; yellowish partly tinted gray, soft, and 0.5m. thick, fossiliferous nearly with same Maync and Said and Barakat microfaunas in addition to new ostracoda species, Acanthocythere jerashensis and Zerqacythere ammanensis.

Sample No.J1: Sandy marl; yellow, soft, rich with Kurnubia palastiniensis–Trocholina palastiniensis and with other microfaunas as J2, and 0.50m thick.

Sample No. A3: Arenaceous biodolomicrite, brownish, medium grained, angular, partly crystalline, with casts of Kurnubia palastiniensis-Trocholina palastiniensis, and 1.5m. thick, (plate-3 and fig. A3).

Sample No. A2: Sandy clay; greyish tinted yellow, medium-finely grained, angular-subangular, soft, 40c. thick with microfaunas similar to those recorded from the Kimmeridgian, Gebel Maghara, Sinai, Egypt, (Said and Barakat, 1958).

Sample No. A1: Arenaceous biodolomite; brownish, sub angular to rounded, well sorted rich with iron oxide, partly recrystalline to micritic with casts of Kurnubia palastiniensis, 1.50m. thick, (pl. 3, figs. A1-a) whereas figs A1; c-d contained Hensonella cylindrica Elliot (1958) range up to Lower Cretaceous. In this study.

Early Cretaceous samples:

Sample No. A4 :Limonitic sandstones, finely angular grained, soft, with carbon spots, 50cm. thick, underlain a truncated surface of A1, and barren.

Sample No. A5: composed of a thick sequence of white massive sandstones, 140m. thick, vuggy, fractured, (water aquifer in case of deeply buried), with carbonized plant pocket remains.

Wadi Essabiel Site:

The sequence is composed of sandy dolomite, compacted, hard, truncated by Wadi Essabiel water course; unconformably overlain by yellowish, bleuwhish, sandy clay, 50cm thick, barren and overlain by a thick sequence of white massive sandstones, 140 m. thick.

3. DISCUSSION

Henson (1948) identified larger imperforate foraminifera from the Upper Jurassic of southwestern Asian countries without pointing clearly the contact of the Lower Cretaceous.

Said and Barakat (1958) identified foraminiferas from Bajocian-Kimmeridgian along the Wadi Maghara, Sinia, Bathonian-Gebel Somer; Callovian-Gebel Ingbashi and the wadi el-Natroun, Egypt, without pointing the boundary between the Jurassic-Lower Cretaceous.

Maync (1966: 31) stated that an erosional gap comprising the Upper Jurassic, from Kimmeridgian upwards exists in most of the analysed sections. The post Jurassic truncation has sometimes even removed the beds assigned to the Pseudocycluslammina jaccardi levels (Upper Oxfordian), so that the Lower Cretaceous unconformably oversteps different levels of the Agathammina Zone correlated with Lower Oxfordian-Callovian.

On the other hand, the writer identified casts of Kurnubia Palstineinsis from the arenaceous biodolomite thin sections of A3 and A1 beds, where the latter bed is unconformably overlain with Early Cretaceous. Consequently, the J2 and J1 marl horizons produce typical Kimmeridgian microfossils similar to those reported by Said and Barakat, from Gebel Maghara, Sinai, Egypt 1958, namely Ammodiscoides magharensis, Reophax scorpium, Ammobaculites glaessneri, A. magharensis, Bolivina bartensite, Marssonella cf. oxycona, Lenticulina plexus quenstedti, Trochammina depressula, Agathammina antiqua, as well as to the index Kimmeridgian- Oxfordia-Callovian world wide microfossils such as; Pseudocycluslammina jaccardi (Schrodt), P.personata Tobler, P. virgulata Maync, Kurnubia palastiniensis Henson, Ophthalmedium cf. tenuissima Henson, and the ostracodes: Bairdia sp., Cytheropteron tuchenses Neal and Sing, C.1040 Grekoff, Schularidea triangularis SwartsandSwain, Acanthocythere jerehensis n.sp., Ektyphocythere dierallaensis Basha, Zerqacythere ammanensis n.sp., Zerqacythere subiehensis Basha. The suggested new ostracoda species Acanthocythere jerashensis and Zerqacythere ammanensis are described herewith below.
Systematic Paleontology
Subclass Ostracoda Lateile, 1806
Order Podocopa Muller, 1894
Suborder Platycopina Sars, 1866
Family Progonocytheridea Silvester-Bradley, 1948
Subfamily Progonocytheriniae Silvester-Bradley, 1948
Genus Acanthocythere (Silvester-Bradley) emended Bate, 1963
_Acanthocythere jerashenensis_ n.sp.
Pl.2, fig.8

Derivation of name: After Jeresh town
Molotype: Male, two carapaces
Type locality: J1 and J2 marls
Stratotype: Kimmeridgian, Jurassic (King Talal Dam Site, west of Jerash)
Diagnosis: Carapace elongate, tumid, centrally with excavations, marginal keel broad and peak like, anterior keel narrow.
Description: Carapace elongate, dorsal margin straight, and slightly convex, ventrally inflated, and concave, surface with 3-4 prominent excavations antero- and postero- centrally; posterior margin broad, and subacute, anterior wide with narrow margin, whereas complex reticulations covered most other parts of the carapace, anterior marginal zone crossed by a few marginal canals, hinge obscure, and the left valve larger than the right one.

Dimensions: Length Height Width
Holotype: 0.55mm. 0.33mm. 0.41mm.

Remarks: The described species is partly similar to _Acanthocythere bakeri_ Basha 1980, but it differs in possessing broad anterior marginal area, 3-4 central deep excavations, and nearly straight dorsal margin.

Family Protocytheridae Ljubicova, 1955
Subfamily Kritonellinae, Bate 1963
Genus Zerqacythere Basha, 1980
_Zerqacythere ammanensis_ n.sp.
Pl.2, fig.10

Derivation of name: After the capital Amman/Jordan
Holotype: Male carapace
Paratype: more than one carapace
Type locality: J1 and J2 marls (King Talal Dam Site, west of Jerash).
Stratotype: Kimmeridgian, Jurassic
Diagnosis: Carapace ovate, inflated, anterior margin rounded, nearly broad, posterior broad and acute, and ventrally excavated.
Description: Carapace ovate, dorsal side straight, antero-dorsal area protrudes, ventral side convex, anterior margin broad, posterior obtusely tapering, round excavations encircle central area, whereas the other parts of the surface covered with complicated reticulations; selvage narrow, with antero-central inverted muscle scar, while hinge is obscure.

Dimensions: Length Height Width
Holotype: 0.61m 0.39m 0.28m
Paratype: 0.55m 0.39m 0.25m

Remarks: The described species is similar in outline with the _Zerqacythere hunensis_ Basha, 1980, but it differs in possessing different ornamentation and obtusely tapering posterior end.

**4. CONCLUSIONS**

The occurrence of _Kurnubia palastiniensis-Trocholina palastiniensis_, as well as _Pseudocyclammina jaccardi_ embedded in the arenaceous biodolomite A3 and A1, and the Kimmeridgian microfaunas in the J2 and J1 horizons, respectively substantiated the existence of Late Jurassic (Kimmeridgian-Oxfordian-Callovian)-Early Cretaceous boundary in Jordan.

Picard and Hirsch (1987), and after revising the studied encircled Maktesh Qatan in Israel (Gill, 1965), Gebel Maghara –Sinia, Egypt (Al-Far, 1966), and Arad Group, North Negev (Goldberg, 1970a) accepted Gill’s sub-units regarding the Upper Jurassic-Lower Cretaceous boundary which seems that the studied areas of King Talal Site Dam, and Arda Road in Jordan are very close, correlatable and match with Gill’s approach of Israel as can be seen below.

<table>
<thead>
<tr>
<th>Israel Subunits</th>
<th>King Talal Dam Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subunit 11-0.6m</td>
<td>= A1</td>
</tr>
<tr>
<td>Subunit 10-0.8m</td>
<td>= A2</td>
</tr>
<tr>
<td>-2.5 m</td>
<td>= A3</td>
</tr>
<tr>
<td>Subunit 9-6.9m</td>
<td>= J1 and J2</td>
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However, the occurrence of *Eligmus cf. aualites* (Stefanini) in Israel, as well as the foraminiferal and ostracoda assemblages in the marl horizons of Jordan substantiated the existence of Kimmeridgian – Oxfordian-Callovian ages.

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**Plate 1**

Fig. 1: *Ammodiscoides magharensis* Said and Barakat, X424.

Fig. 2: *Reophax scorpiurus* Montfort, X16.

Fig. 3: *Ammobaculites glaesnneri* Said and Barakat, X104.

Fig. 4: *Ammobaculites magharensis* Said and Barakat, X223.

Fig. 5: *Pseudocyclammina jaccardi* (Schrodt), X144.

Fig. 6: *Pseudocyclammina Jaccardi* (Schordt), X104.

Fig. 7: *Pseudocyclammina personata* Tobler, X188.

Fig. 8: *Pseudocyclammin a virgulata* Mayne, X180.

Fig. 9: *Bolivina bartensteini* Said and Barakat, X52.

Fig. 10: *Marssonella cf. oxycona* (Reuss), X192.

Fig. 11: *Trocholina palastiniensis* Henson, X208.

Fig. 12: *Lenticulina pleux quenstedi* (Gumbel), X58.

Fig. 13: *Kurnubia palastiniensis* Henson, X85.

Fig. 14: *Kurnubia palastiniensis* Henson, X 136.

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**Plate 2**

Fig. 1: *Trochammina depressula* Said and Barakat, X212.

Fig. 2: *Agathammina antiqua* Said and Barakat, X292.

Fig. 3: *Ophthamidium cf. tenuissimum* Henson, X248.

Fig. 4: *Bairdia* sp., X196.

Fig. 5: *Cytheropteron kutchensis* Neal and Sing, X196.

Fig. 6: *Cytharopteron 1040* Grekoff, X248.

Fig. 7: *Schularidida triangularis* Swartz and Swain, X200.

Fig. 8: *Acanthocythere jerashe nensis* n. sp., X140.

Fig. 9: *Ektypochthere dierallaensis* Basha, X180.

Fig. 10: *Zerqacythere ammanensis* n.sp., X224.

Fig. 11: *Zerqacythere subiehensis* Basha, X200.

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**Plate 3**

Fig. 1.A3: Biodolomicrite showing casts of *Kurnubia palastiniensis* Henson.

Fig. 2.A1-a: Arenaceous bio- dolomite with *Kurnubia palastiniensis* Henson.

Figs. A1-b and c: Arenaceous biodolomite with *Kurnubia palastiniensis* Henson and *Hensonella cylindrica* Elliot.
5. REFERENCES


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* ترجمة

**العنوان**

تبدأ الأدغال الصغرى في الأعلى - الجنسية في الأردن

**المختصر**

بوش حسن سعيد

**التركيز على**

الحيوية البحرية الأثارية في المنطقة المتحركة، حيث يظهر الأردان الأثريين على أثر التوسع في القرن الثاني عشر، والميثاق الاسترالي للسلاسل، والقشط الأزرق، والكشط الأبيض، والعديد من الأنواع الأخرى.

**الملخص**