------ Iraqi Jour. Earth Sci., Vol.5, No.1, pp.1-8, 2005 ------

Biostratigraphy of the Kometan and Gulneri Formations (Upper Cretaceous) in Jambur well No. 46, Northern Iraq

Tarik S. Abawi
Department of Geology
College of Science
Mosul University

Saad A. Mahmood
Northen Oil Company
Geology Department
Kirkuk

(Received 11/3/2004 , Accepted 5/9/2004)

ABSTRACT

Thirty eight planktonic foraminiferal species were recorded from the Kometan and Gulneri Formations in the subsurface section of Jambur well No. 46, northern Iraq. On the basis of stratigraphic ranges of the recorded foraminifera the studied sequences are attributed to *Helvetoglobotruncana helvetica*, *Marginotruncana sigali*, *Dicarinella primitiva*, *D. concavata*, *Rosita fornicata* and *Globotruncanita elevata* Zones. The Gulneri Formation is Middle to Late Turonian in age, whereas the Kometan Formation ranges from Late Turonian to Early Campanian.

الطباقية الحياتية لتكويني كوميتان وكولنيري (الكريتاسي العلوي) في بئر جمبور ٤٦، شمال العراق

الملخص

سجل ٣٨ نوعا من الفورامنيفرا الطافية ضمن تكويني كوميتان وكـولنيري فـي المقطـع تحـت السطحي لبئر جمبور ٤٦، شمال العراق. اعتمادا على حشود الفورامنيفرا المسجلة تـم تحديـد الانطقـة الحياتية الآتية:

Helvetoglobotruncana helvetica, *Marginotruncana sigali*, *Dicarinella primitiva*, *D. concavata*, *Rosita fornicata* and *Globotruncanita elevata* Zones.

كما تم مضاهاة الأنطقة المذكورة مع دراسات أجريت داخل القطر وخارجه.

حدد عمر تكوين كولنيري بالتورونيان الاوسط وحتى التورونيان المتأخر بينما يمتد تكوين كوميتان من التورونيان المتاخر وحتى الكامبانيان المبكر.

INTRODUCTION

The Kometan Formation was first described by Dunnington in 1953 (Bellen et al., 1959) from Kometan village northeast of Iraq. The formation at its type locality is 36m thick, consisting of light grey, thinly bedded, globigerinal-oligosteginal limestone, locally silicified, with chert concretions in occasional beds and glauconitic especially at the base

(Bellen et al., 1959). According to Bellen et al. (1959) the age of the Kometan Formation at its type locality is Early Turonian at the base and perhaps Santonian at the top.

According to Buday (1980) the type Kometan Formation indicates beds of deeper neritic, globigerinal, open sea facies as well as the oligosteginal facies of the same environment.

The Gulneri Formation was originally introduced by Lancaster Jones in 1957 (Bellent et al., 1959) from the site of the Dokan Dam in the High Folded Zone, northeast of Iraq. According to the original description the formation is about 1.1-1.2 m thick, consists of black, bituminous, finely laminated, calcareous shale with some glauconite and collophane in its lower part and should be of Early Turonian age (Bellen et al., 1959).

According to Buday (1980) the Gulneri Formation represents the sediments of relict sea, existing between the regression in the Cenomanian and the transgression in the Turonian.

The present paper intends to give an account of the planktonic foraminiferal biostratigraphy of the Kometan and Gulneri Formations from the subsurfaces section of Jambur well No. 46, located about 35km southeast of Kirkuk City. Northern Iraq (Fig.1).

Fig.1: Location map of Jumbur well No.46.

LITHOLOGY

In Jambur well No.46 the investigated section extends from 2357-2577m and is represented stratigraphically by the Kometan Formation of 207m thickness (from depth 2357-2564m) and the Gulneri Formation of 13m thickness (from depth 2564-2577m) (Fig.2). 124 cutting samples, obtained from the studied section at intervals ranging from 1 to 3m, were investigated with regard to their planktonic foraminifera. The Kometan Formation in the investigated well consists of limestone with some intercalations of marly limestone and shale. The lithology of the Gulneri Formation comprises black calcareous shale rich in organic matter. The contact between Gulneri and Kometan Fomations in the studied section represents a local unconformity. The Gulneri Formation is unconformably underlain by the Dokan Formation of Cenomanian age, whereas the Shiranish Formation overlies unconformably the Kometan Formation (Mahmood, 1997).

BIOSTRATIGRAPHY

The studied section yielded rich planktonic foraminiferal fauna. Thirty eight planktonic foraminiferal species belonging to 14 genera were recorded from the investigated sequence. The planktonic foraminiferal assemblages recorded are of typical Tethyan character. The stratigraphic distribution of the foraminiferal species is shown in figure 2.

The stratigraphic distribution of the planktonic foraminifera recorded from the Kometan and Gulneri Formations permits the recognition of six biozones, these are from top to bottom:

Globotruncanita elevata Zone
Rosita fornicata Zone
Dicarinella concavata Zone
Dicarinella primitiva Zone
Marginotruncana sigali Zone
Helvetoglobotruncana helvetica Zone

The present zones are correlated with similar zones established by Bolli (1966) general system, by Wonders (1980) in the Western Mediterranean, by Caron (1985) general system, by Sliter (1989) in the Pacific Ocean, by Abawi and Hammoudi (1997) in North Iraq (Fig. 3).

Helvetoglobotruncana helvetica Total range Zone

Characteristics: The zone is based on the total stratigraphic range of *H. helvetica* (Bolli). The base of the zone is placed at the first appearance of the zonal marker, while the top of the zone is marked by the last occurrence of the nominate taxon.

The present zone unconformably overlies the *Rotalipora cushmani* Zone (Late Cenomanian) of the topmost Dokan Formation.

Thickness: 12 m, within the Gulneri Formation.

Correlation: Caron (1985) and Sliter (1989) defined the *H. helvetica* Zone as the interval of the total range of the nominate taxon and assigned its age to Middle Turonian. The *H.*

helvetica Zone as defined here is correlative to the *H. helvetica* Zone of Wonders (1980), Caron (1985) and Sliter (1989) and thus of Middle Turonian age.

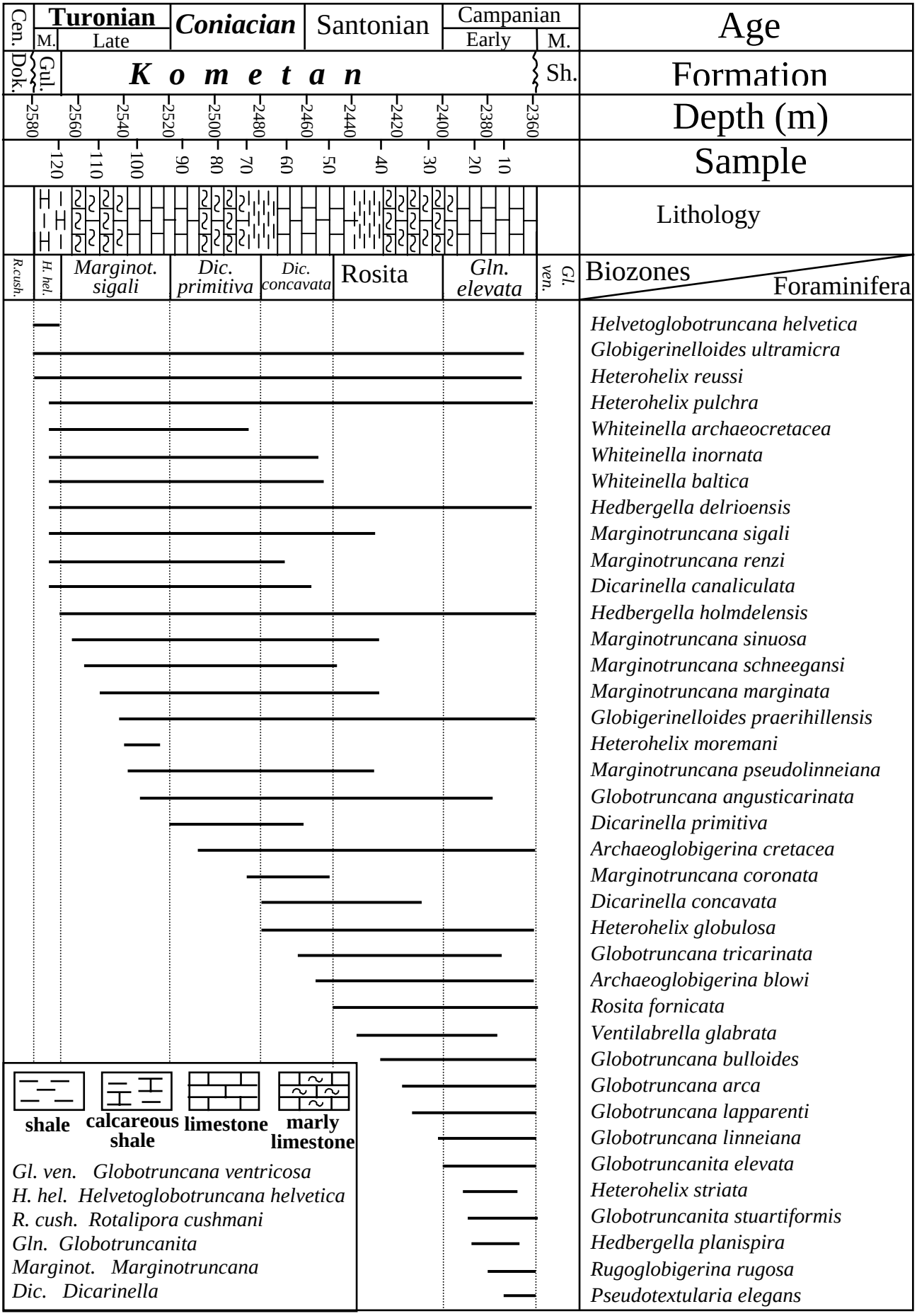

Fig.2: Biostratigraphic zonation of the Upper Cretaceous sequence in Jambur well

<table>
<tr><th>Age</th><th>Bolli,
1966
General</th><th>Wonders,
1980
Mediterranean</th><th>Caron,
1985
General</th><th>Sliter,
1989
Circum Pacific</th><th>Abawi &
Hammoudi,
1997
N. Iraq</th><th>Present work
Ja. Well 46
N. Iraq</th></tr>
<tr><td rowspan="3">Campanian</td><td>Globotruncana calcarata</td><td>Globotruncana calcarata</td><td>Globotruncana calcarata</td><td>Globotruncana calcarata</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td rowspan="2">Globotruncana stuarti s. l.</td><td>Globotruncana ventricosa</td><td>Globotruncana ventricosa</td><td>Globotruncana ventricosa</td></tr>
<tr><td>Globotruncana elevata
Marginotruncana carinata</td><td>Globotruncanita elevata</td><td>Globotruncanita elevata</td><td>Globotruncanita elevata</td><td>Globotruncanita elevata</td></tr>
<tr><td rowspan="3">Santonian</td><td rowspan="2">Globotruncana fornicata</td><td rowspan="2">Globotruncana carinata</td><td rowspan="2">Dicarinella asymetrica</td><td rowspan="2">Dicarinella asymetrica</td><td rowspan="2">Rosita fornicata</td><td rowspan="2">Rosita fornicata</td></tr>
<tr><td>Globotruncana concavata</td></tr>
<tr><td>Marginotruncana concavata</td><td rowspan="2">Dicarinella concavata</td><td rowspan="2">Dicarinella concavata</td><td rowspan="2">Dicarinella concavata</td><td rowspan="2">Dicarinella concavata</td></tr>
<tr><td>Coniacian</td><td>Globotruncana schneegansi</td><td>Marginotruncana primitiva</td></tr>
<tr><td rowspan="3">Turonian</td><td rowspan="2">Globotruncana helvetica</td><td>Dicarinella primitiva</td><td rowspan="2">Marginotruncana sigali</td><td>Dicarinella primitiva</td><td>Dicarinella primitiva</td></tr>
<tr><td>Marginotruncana sigali</td><td>Marginotruncana sigali</td><td>Marginotruncana sigali</td><td>Marginotruncana sigali</td></tr>
<tr><td rowspan="2">Praeglobotrun-cana gigantea</td><td>Helvetoglobotruncana helvetica</td><td>Helvetoglobotruncana helvetica</td><td>Helvetoglobotruncana helvetica</td><td rowspan="2"></td><td>Helvetoglobotrun-cana helvetica</td></tr>
<tr><td>Whiteinella archaeocretacea</td><td>Whiteinella archaeocretacea</td><td>Whiteinella archaeocretacea</td><td></td></tr>
</table>

Hiatus

Not studied

Fig.3: Correlation of the zonal scheme of the studied sequence with those proposed by some authors.

***Marginotruncana sigali* Interval Zone**

Characteristics: The zone is defined as that part of the range of *M. sigali* (Reichel) above the last occurrence of *H. helvetica* (Bolli) and below the first appearance of *Dicarinella primitiva* (Dalbiez). The base of this zone is marked by the extinction of *H. helvetica* (Bolli), the top of the zone corresponds to the first appearance of *D. primitiva* (Dalbiez).

Thickness: 48 m, the lower part of this zone is within the Gulneri Formation, while the upper part of the zone extends into Kometan Formation.

Correlation: Caron (1985) defined the *M. sigali* Zone as that interval of *M. sigali* (Reichel) which starts from the extinction of *H. helvetica* (Bolli) to the first occurrence of *D. primitiva* (Dalbiez) and assigned it to Late Turonian age. The *M. sigali* Zone as defined here is correlative to the *M. sigali* Zone of Caron (1985) and thus of Late Turonian age. This zone is also equivalent to the lower part of *M. sigali* Zone of Sliter (1989) and the *M. sigali* Zone of Abawi and Hammoudi (1997) of Late Turonian age.

The first occurrence of *D. primitiva* (Dalbiez) that defines the top of this zone is also considered here to mark the Turonian/Coniacian boundary, (see also Masters 1977, Wonders 1980 and Caron 1985).

***Dicarinella primitiva* Interval Zone**

Characteristics: This zone is defined as the interval of *D. primitiva* (Dalbiez) prior to the first occurrence of *Dicarinella concavata* (Brotzen). The lower boundary of this zone is marked by the first appearance of the zonal maker, the top of the zone is placed at the first appearance of *D. concavata* (Brotzen).

Thickness: 36 m, within the middle part of the Kometan Formation.

Correlation: Caron (1985) described the *D. primitiva* Zone as the interval from the first occurrence of zonal marker to first occurrence of *D. concavata* (Brotzen) and assigned it to Early Coniacian age. The present zone is equivalent to the *D. primitiva* Zone of Caron (1985) and thus of Early Coniacian age. The zone is also correlated with the upper part of the *M. sigali* Zone of Sliter (1989) and the *D. primitiva* Zone of Abawi and Hammoudi (1997) of Early Coniacian age.

***Dicarinella concavata* Interval Zone**

Characteristics: This zone is defined as that part of the range of nominate taxon below the first appearance of *Rosita fornicata* (Plummer). The lower limit of this zone corresponds to the first occurrence of the zonal marker, the top of the zone is drawn at the first appearance of *R. fornicata* (Plummer).

Thickness: 36 m, within the Kometan Formation.

Correlation: Caron (1985) defined the *D. concavata* Zone as the interval from the first occurrence of the zonal marker to the first appearance of *Dicarinella asymetrica* (Sigal) and assigned it to Late Coniacian-Early Santonian age. *D. asymetrica* (Sigal) has not been recorded in the present study. The first appearance of *R. fornicata* (Plummer) is considered here to delimit the top of this zone. The present zone is equivalent to the *D. concavata* Zone of Caron (1985) and thus of Late Coniacian-Early Santonian age. This zone is also correlated with the *D. concavata* Zone of Sliter (1989) and Abawi and Hammoudi (1997) of Late Coniacian-Early Santonian age.

The Coniacian / Santonian boundary is drawn at the last occurrence of *D. primitiva* (Dalbiez).

***Rosita fornicata* Interval Zone**

Characteristics: The zone is characterized by the occurrence of the nominate taxon below the first appearance of *Globotruncanita elevata* (Brotzen). The base of the zone is marked by the first appearance of the zonal marker, while the top of the zone corresponds to the first appearance of *G. elevata* (Brotzen).

Thickness: 46 m, within the upper part of the Kometan Formation.

Correlation: Bolli (1966) defined the *Globotruncana fornicata* Zone to form the Upper Santonian. The *R. fornicata* Zone as defined here is correlative to the younger part of *Globotruncana concavata* Zone and the *Gl. fornicata* Zone of Bolli (1966) and thus of upper Early Santonian – Late Santonian age. The zone is also equivalent to the *D. asymetrica* Zone of Caron (1985) and Sliter (1989) of upper Early Santonian to Late Santonian age.

The first appearance of *G. elevata* (Brotzen) that defines the top of the present zone is also considered here to mark the Santonian / Campanian boundary, (see Postuma 1971 and Masters 1977).

***Globotruncanita elevata* Interval Zone**

Characteristics: The zone is defined as that part of the range of *G. elevata* (Brotzen) below the horizon of the first appearance of *Globotruncana ventricosa* White. The base of the zone is marked by the first occurrence of the zonal marker, the top of the zone is placed immediately below the horizon of the first occurrence of *Gl. ventricosa* White, which is recorded at the base of the Shiranish Formation.

The *G. elevata* Zone unconformably underlies the *Gl. ventricosa* Zone (Middle Campanian) of the lowermost part of the Shiranish Formation.

Thickness: 42 m, repersenting the uppermost part of the Kometan Formation.

Correlation: Caron (1985) defined the *G. elevata* Zone by that part of the range of the nominate taxon from the last occurrence of *D. asymetrica* (Sigal) to the first occurrence of *Gl. ventricosa* White and assigned it to Early Campanian age. In the present study the first appearance of *G. elevata* (Brotzen) is considered to delimit the base of this zone, (see Postuma 1971 and Masters 1977). The present zone is equivalent to the *G. elevata* Zone of Caron (1985) and thus of Early Campanian age. The zone is also correlated with the *G. elevata* Zone of Sliter (1989) and Abawi and Hammoudi (1997) of Early Campanian age.

CONCLUSION

The Gulneri Formation of the Upper Cretaceous sequence, from the subsurface section of Jambur well No. 46 is attributed to the *Helvetoglobotruncana helvetica* and the lower part of the *Marginotruncana sigali* Zones of Middle to Late Turonian age. The Kometan Formation is assigned to the upper part of the *Marginotruncana sigali*, the *Dicarinella primitiva*, the *Dicarinella concavata*, the *Rosita fornicata* and the *Globotruncanita elevata* Zones and ranges in age from Late Turonian to Early Campanian.

REFERENCES

Abawi, T.S. and Hammoudi, R.A., 1997. Foraminiferal biostratigraphy of the Kometan and Gulneri Formations (Upper Cretaceous) in Kirkuk area, North of Iraq. Iraq. Geol. Jour., V.30 (2), pp.139-146.

Bellen, R.C. Van, Dunnington, H.V., Wetzel, R. and Morton. D., 1959. Lexique Stratigraphique International. Asie, Iraq, 3(10a), 333 p.

Bolli, H.M., 1966. Zonation of Cretaceous to Pliocene marine sediments based on planktonic foraminifera. Bol. Inform. Asoc. Venezolana Geol. Mineria Petrol., V. 9 (1), pp.3-32.

Buday, T., 1980. Stratigraphy and paleogeography, in: Kassab, I.I. M. and Jassim, S.Z. (eds.): The regional geology of Iraq, SOM (D.G. Geol. Surv. Min. Invest.), Baghdad, V.1, 445 p.

Caron, M., 1985. Cretaceous planktic foraminifera, in: Bolli, H.M., Saunders, J.R. and Perch-Nielsen, K. (eds.): Plankton stratigraphy. Cambridge Univ. Press, pp. 17-86.

Mahmood, S.A., 1997. Biostratigraphy of the Dokan, Gulneri and Kometan Formations in the subsurface section Jambur well No. 46, Northern Iraq. M.Sc. Thesis (in Arabic), Mosul Univ., Mosul, 85 p.

Masters, B.A., 1977. Mesozoic planktonic foraminifera, a world-wide review and analysis, in: Ramsay, A.T.S. (ed.): Oceanic Micropaleontology, Academic Press, London, pp. 301-731.

Postuma, J., 1971. Manual of planktonic foraminifera. Elsevier Publishing Co., Amsterdam, 420 p.

Sliter, W.V., 1989. Biostratigraphic zonation for Cretaceous planktonic foraminifers examined in thin section. Jour. Foram. Res., V. 19 (1), pp. 1-19.

Wonders, A. A. H., 1980. Middle and Late Cretaceous planktonic foraminifera of the western Mediterranean area. Utrecht Micropaleont. Bulletin, V.24, pp.1-158.