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Lithostratigraphy and Biostratigraphy of Gadvan and Dariyan formations in Gachsaran Oilfield by Investigation of Wells Number 55 and 83

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ABSTRACT

Gadvan and Dariyan formations were studied according to lithostratigraphic and biostratigraphic characteristics in wells number 55 and 83 of Gachsaran oilfield. Investigation of microscopic thin sections resulted in identification of 10 genus and 11 species of benthic foraminifera, 1 species of pelagic foraminifera and 1 species of various calcareous algae in well number 55 and also 17 species belonging to 14 genus of benthic foraminifera, 1 species of pelagic foraminifera and 2 species of various calcareous algae in well number 83. According to lithostratigraphic characteristics, Gadvan Formation is composed of 3 parts including lower shale, Khalij limestone member and upper shale. Lithology of Dariyan Formation is mostly limestone. Based on extension of stratigraphy of identified index foraminifera, one Barren interval zone and one assemblage zone, with age of late Neocomian– early Aptian for Gadvan Formation and one assemblage zone with the age of late Aptian for Dariyan Formation were introduced. In each one of studied wells, the upper boundary of Gadvan Formation had conformably with limestone Dariyan Formation and its lower boundary had conformably with limestone Fahliyan Formation. The upper boundary of Dariyan Formation has disconformably with shales of Kazhdomi Formation.

KEY WORDS: Gadvan, Dariyan, Gachsaran oilfield, Biozone.

1- INTRODUCTION

Gadvan and Dariyan formations are located in the upper part of Khami group. The Khami group is one of the deepest oil reservoirs in south west of Iran which is in Dezful embayment with a thickness of more than 1500 meters. It is separated from Bangestan group by Kazhdomi shaley Formation.

The Gadvan and Dariyan formations in north of Dezful Embayment and south of Fars area has been formed mainly of carbonates. Thickness of Gadvan Formation in the mentioned zone increases toward Khoramshahr and Basreh area. Dariyan Formation in the south west of Iran (except south-southwest of Lurestan) is equivalent of the Shoayba Formation in the Arabic country [1].

2- Previous studies

Zagros zone refers to the regions in the south west of Neotethyscrack including the heights in the West and South West of Iran. Zagros is one of geological zones of Iran, and it is part of Alps-Himalaya mountain generating belt that extends from north west to south east with an approximate length of 1500 kilometers and a width of 1003 kilometers from the south west of Turkey to Hormoz Bay in Iran [2].

Due to significant oil reservoirs existing in Zagros Mountains, geology of this region has been investigated by normous world geologists from past till now. James and Wynd [3] upgraded that lithostratigraphic unit to a group including Surmeh and Hith formations from Jurassic and Fahliyan, Gadvan and Dariyan formations from Cretaceous.

Some of the studies in Gadvan and Dariyan formations has been done by: Wynd [4]; Bolz [5]; Adams et al. [6]; Khalili [7]; Sissingh [8]; Ashkpour [9]; Ghalavand [10]; Armoon [11]; Barzegar Zarandi et al. [12]; Pakdaman [13]; Movahed [14]; Reisi [15].

The study area (Gachsaran oilfield) is one of the largest oilfields of Iran in Zagros basin which is located within 220 kilometers from South east of Ahwaz city. This field is an anticline with 70 kilometers length and 6-15 kilometers width, which is located in the general North west– South east of Iranian oilfield anticlines. In Kohgiloyeh and Boyrahmad Province, this field is in the vicinity of Garnegan, Chalingar, Pazanan and Bibi Hakimeh fields. (Figure 1)

From this field, wells number 55 and 83 have been studied. In the figure 2 , their locations are shown.

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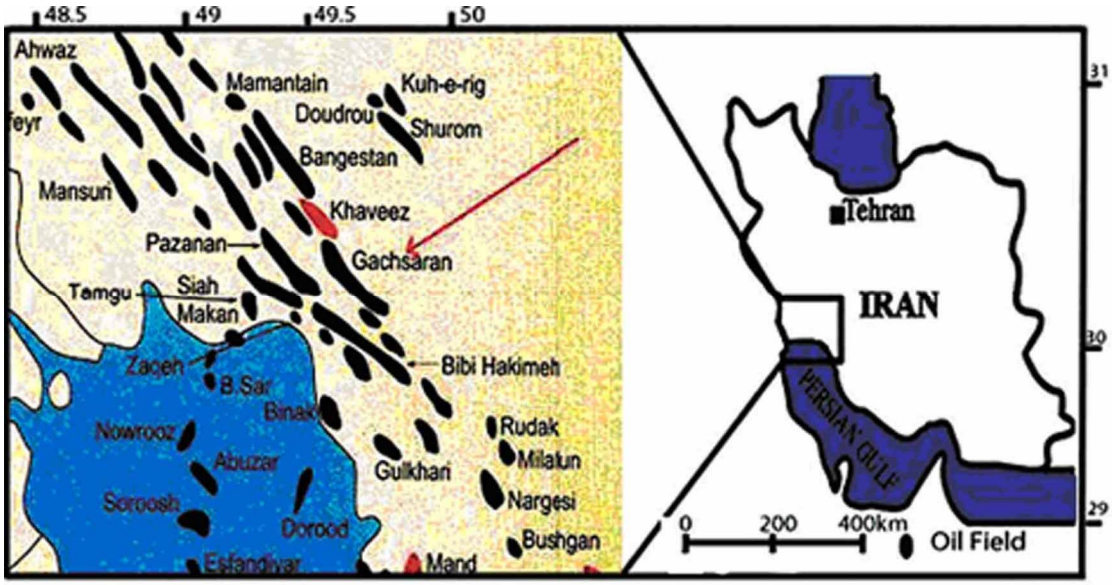

Figure 1: location of Gachsaran oilfield in Dezful embayment (Adopted from N.I.O.S.C).

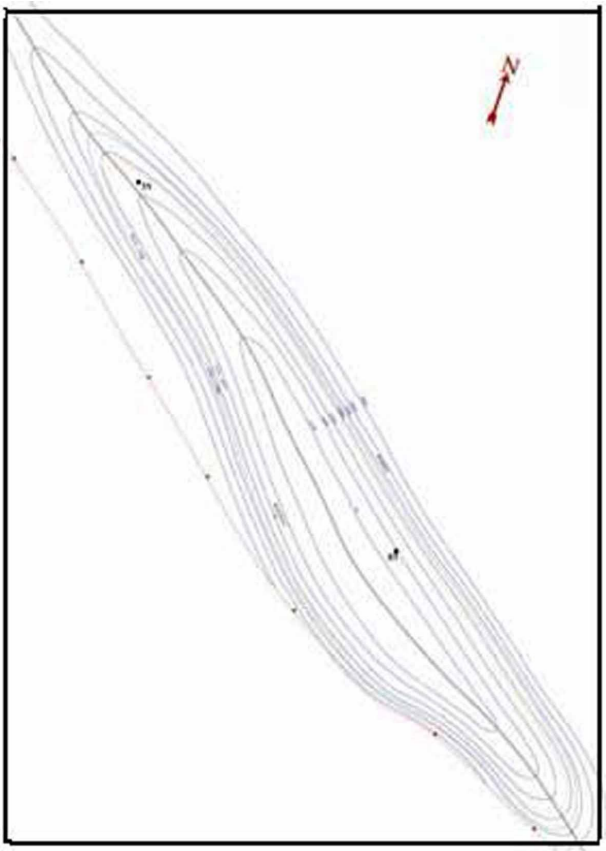

Figure 2: Underground contour (UGC) of Gachsaran oilfield and location of wells number 55 and 83 (Adopted from N.I.O.S.C).

3- MATERIAL AND METHOD

To identify lithostratigraphic and biostratigraphic units of Gadvan and Dariyan formations, totally 266 microscopic thin sections were studied. In this study, in order to identify the boundary between formations, facies changes and the lateral connection between them , well logging charts and graphic logs have been used. To identify and name micro fossils, various references like Loeblich and Tappan [16]; Sampo [17]; Mehrnush and Partoazar [18]; Amiri Bakhtiar et al., [19] have been used. After identification of benthic foraminifera, based on their dispersion, appearance and

disappearance, one barren interval zone and two assemblage zones were introduced for Gadvan and Dariyan formations.

4- Lithostratigaraphy of the formations in each one of studied wells

4-1- Lithostratigaraphy of Gadvan Formation

The excavated thickness from Gadvan Formation in well number 55 of Gachsaran oilfield is 80 meters (Figure 3). Top of this Formation was in depth of 3571 meters and its base was in depth of 3651 meters. According to lithologic characteristics, Gadvan Formation is composed of three rock units: lower shale with 41 meters thickness, the Khalij limestone member with 13 meters thickness and upper shale with 26 meters thickness. This Formation has 74 meters thickness in well number 83 of Gachsaran oilfield (Figure 4). The top of Formation is located in depth of 3091 meters and its base in depth of 3165 meters. In this well also all three rock units of lower shale with 36 meters thickness, Khalij limestone member with 15 meters thickness and upper shale with 23 meters thickness are seen. The lower and upper shales are identified with main lithology of shale, together with argillaceous limestone and Dolomite interbeds. The Khalij limestone member is made of porous limestone.

4-2- Lithostratigaraphy of Dariyan Formation

The thickness of Dariyan Formation in well number 55 of Gachsaran oilfield is 39 meters (Figure 3). The top of this formation is located at depth of 3532 meters and its base at depth of 3571 meters. Its upper boundary with Kazhdomi Formation is determined by reduction in natural Gama ray. This boundary is in disconformably and erosion form. The top of this formation in well number 83 of Gachsaran oilfield is located at depth of 3065 meters and its base at depth of 3091 meters and its thickness is 26 meters. The main lithology of this formation is limestone with argillaceous limestone and dolomite interbeds.

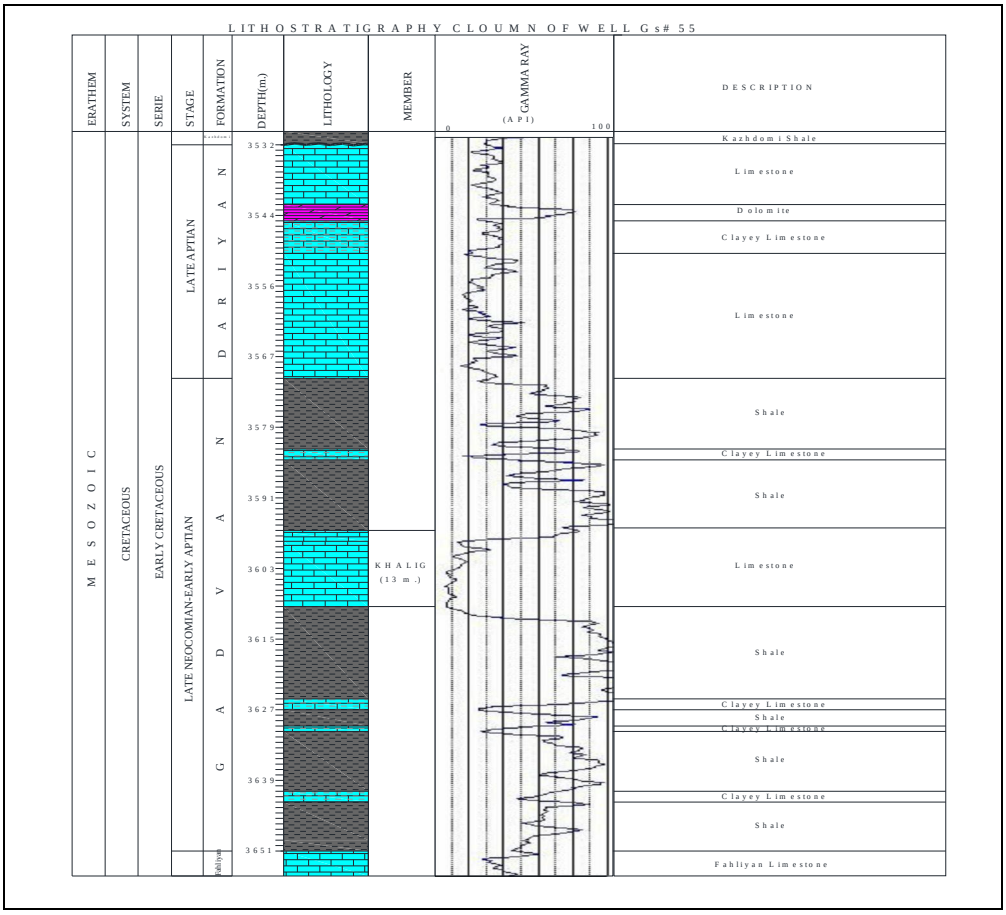

Figure 3 - Litostratigraphic column of Gadvan and Dariyan Formations in Gachsaran oilfield, well No. 55 (Zagros basin, south west of Iran)

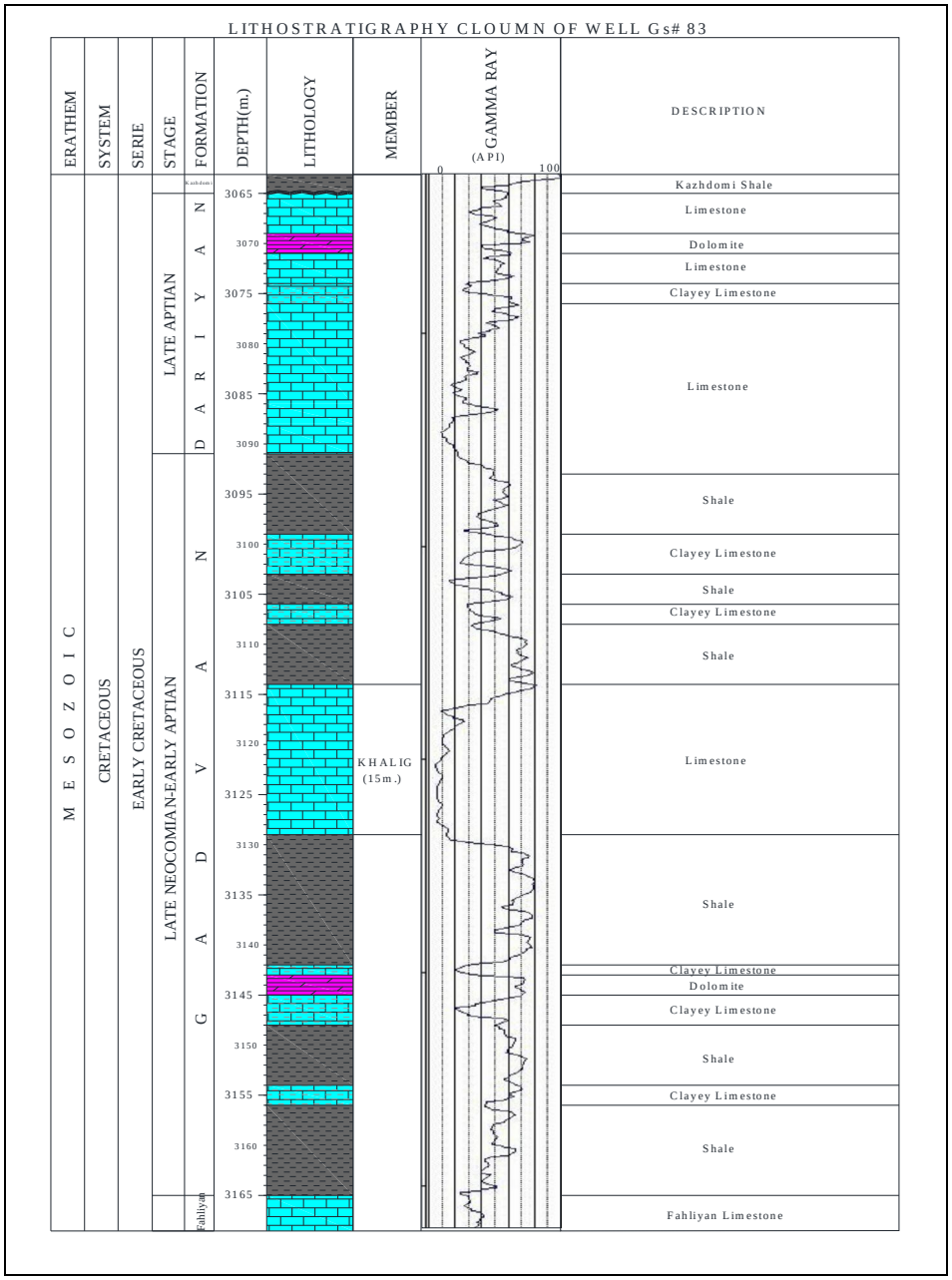

Figure 4 - Litostratigraphic column of Gadvan and Dariyan Formations in Gachsaran oilfield, well No. 83 (Zagros basin, south west of Iran)

5- Biozonation of Gadvan and Dariyan Formations in each of studied wells:

At this part, firstly biozones of the region have been determined according to dispersion of identified foraminifera. Then identified biozones have been compared with presented biozones in Zagros basin [2].

Detailed paleontology study in these wells indicated that these deposits are mostly consist of benthic foraminifera with agglutinated test. Gadvan Formation is in biological range of late Neocomian-early Aptian and age of Dariyan Formation is late Aptian. Based on this, in studied wells of Gadvan and Dariyan formations, one barren interval zone and two assemblage zones are determined, as follows:

Barren interval zone:

This zone is introduced at the base of Gadvan Formation in wells number 55 (Figure 5) and 83 (Figure 6) of Gachsaran oilfield which is almost lack of fossil. The thickness of this zone in well number 55 of Gachsaran oilfield is 41 meters and in well number 83 is 36 meters. In terms of lithology, this zone encompasses lower shaley member of Gadvan Formation in both of wells. The suggested age for this zone is late Neocomian.

Assemblage zone number 1:

1) *Choffatella decipiens – Pseudocyclammina littus – Trocholina longata* Assemblage **Zone**

The thickness of this zone in well number 55 of Gachsaran oilfield is 39 meters and the following foraminifera and non-foraminifera are seen with this biozone:

Choffatella decipiens , *Trocholina elongata, Palorbitolina lenticularis, Dictyoconus arabicus, Textularia* sp., *Lenticulina* sp. , *Pseudocyclammina littus* , *Globigerinelloides* sp. , *Salpingoporella dinarica*

The thickness of this zone in well number 83 of Gachsaran oilfield is 36 meters and the following foraminifera and non-foraminifera are seen with this biozon:

Choffatella decipiens , *Orbitolina* sp. , *Orbitolina kurdica, Iraqia simplex, Pseudochrysalidina* sp., *Dictyoconus arabicu, Textularia* sp., *Trocholina elongata, Lenticulina* sp., *Pseudocyclammina* sp., *Haplophragmoides* sp., *Pseudocyclammina littus* , *Permocalcalus* sp. , *Salpigoporella dinarica* .

According to studies, this fauna assemblage in terms of time is, relatively comparable with Wynd's number 15 biozone, *Choffatella– Cyclammina* Assemblage Zone [2] in south west region (Zagros) of Iran. The suggested age for this assemblage zone is early Aptian. This assemblage zone encompasses Khalij limestone member and upper shale of Gadvan Formation.

Assemblage zone number 2:

2) *Orbitolina texana - Choffatella decipiens* Assemblage Zone

This assemblage zone with 39 meters thickness in well number 55 contains the following microfossils:

Choffatella decipiens, Orbitolina texana, Palorbitolina lenticularis, Dictyoconus arabicus, Textularia sp., *Lenticulina* sp. , *Globigerinelloides* sp.

This assemblage zone in well number 83 has 26 meters thickness and includes following foraminifera and non-foraminifera:

Choffatella decipiens, Debarina sp. , *Textularia* sp. , *Lenticulina* sp. ,*Globigrrinelloides* , *Salpigoporella dinarica.*

This fauna assemblage can be considered comparable with Wynd's number 16 assemblage zone [2], *Hensonella – O rbitolina – Choffatella* Assemblage Zone from south west regions of Iran (Zagros).

Based on fossils mentioned above, and being located in this assemblage zone, the age of late Aptian is suggested for this assemblage zone. We correlated biostratigraphy column in the each well together (Figure 7).

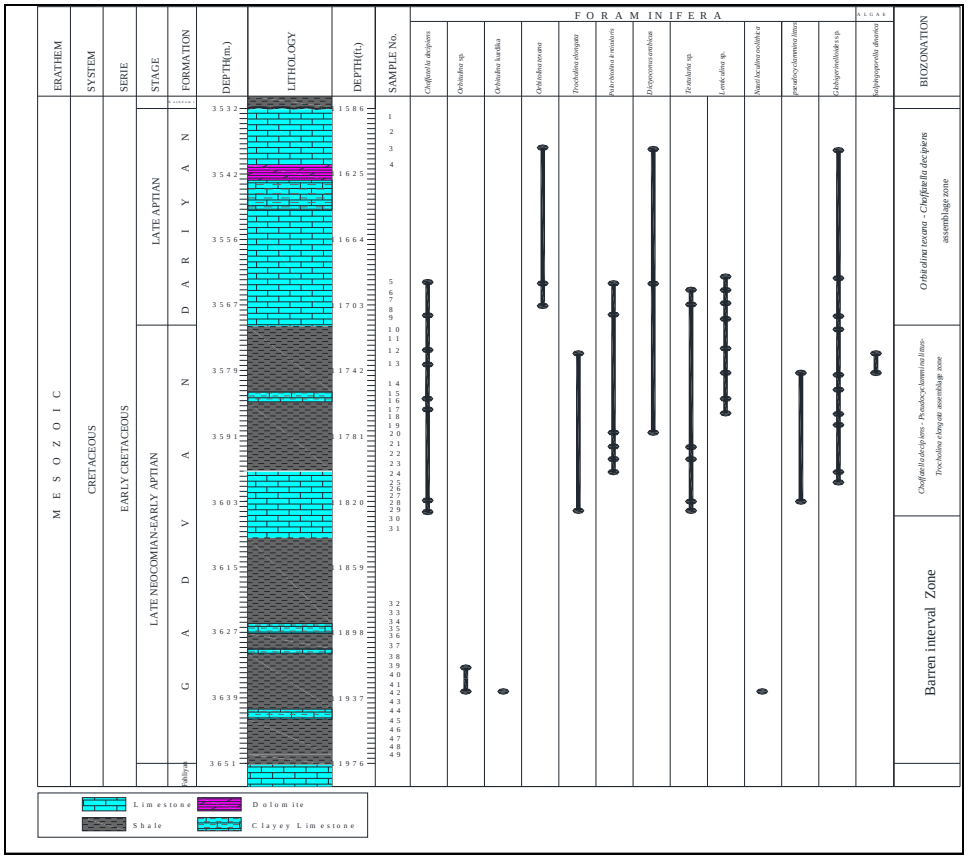

Figure 5- Biostratigraphic column of Gadvan and Dariyan Formations in Gachsaran oilfield, well No. 55 (Zagros basin, south west of Iran)

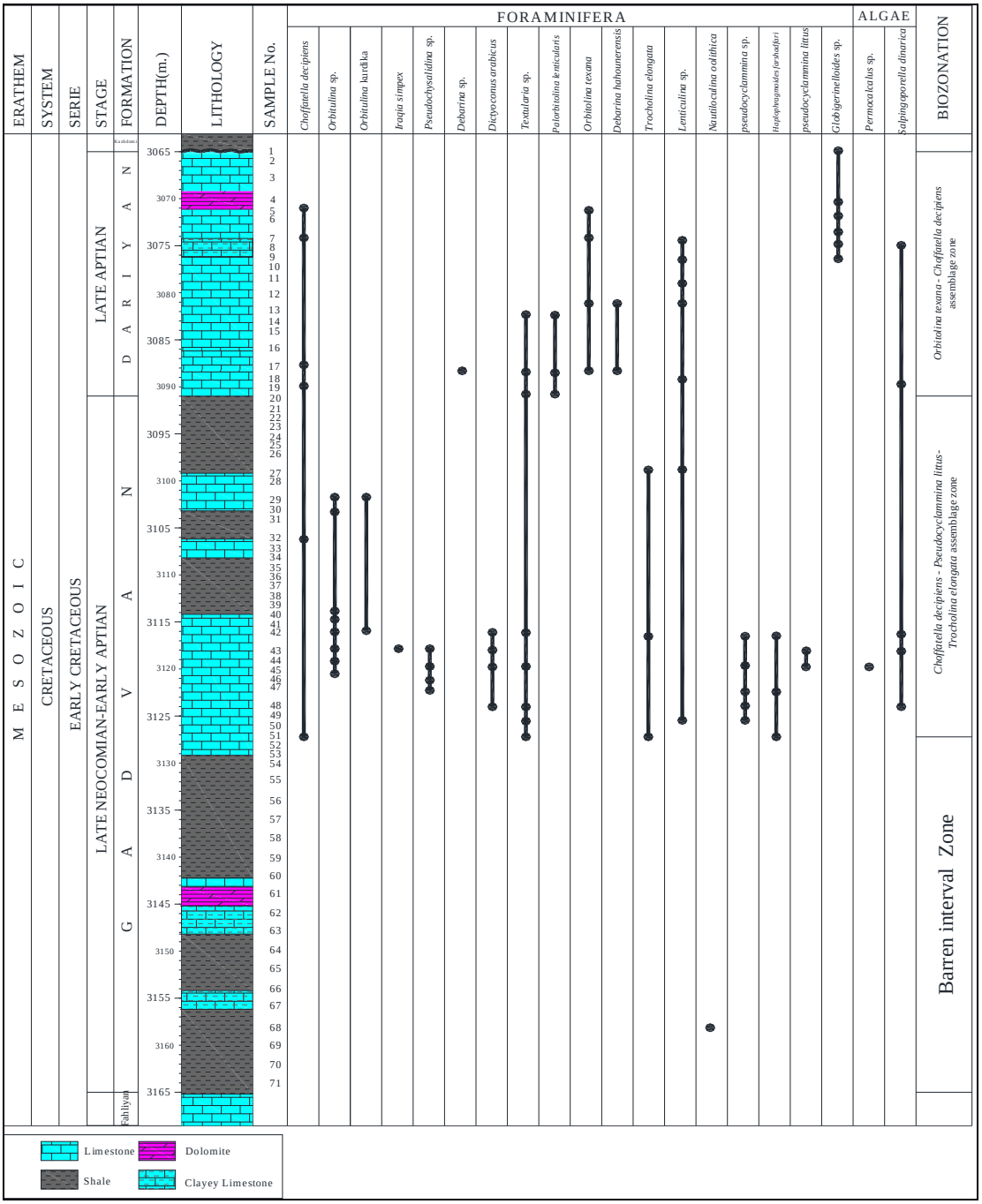

Figure 6- Biostratigraphic column of Gadvan and Dariyan Formations in Gachsaran oilfield, well No. 83 (Zagros basin, south west of Iran)

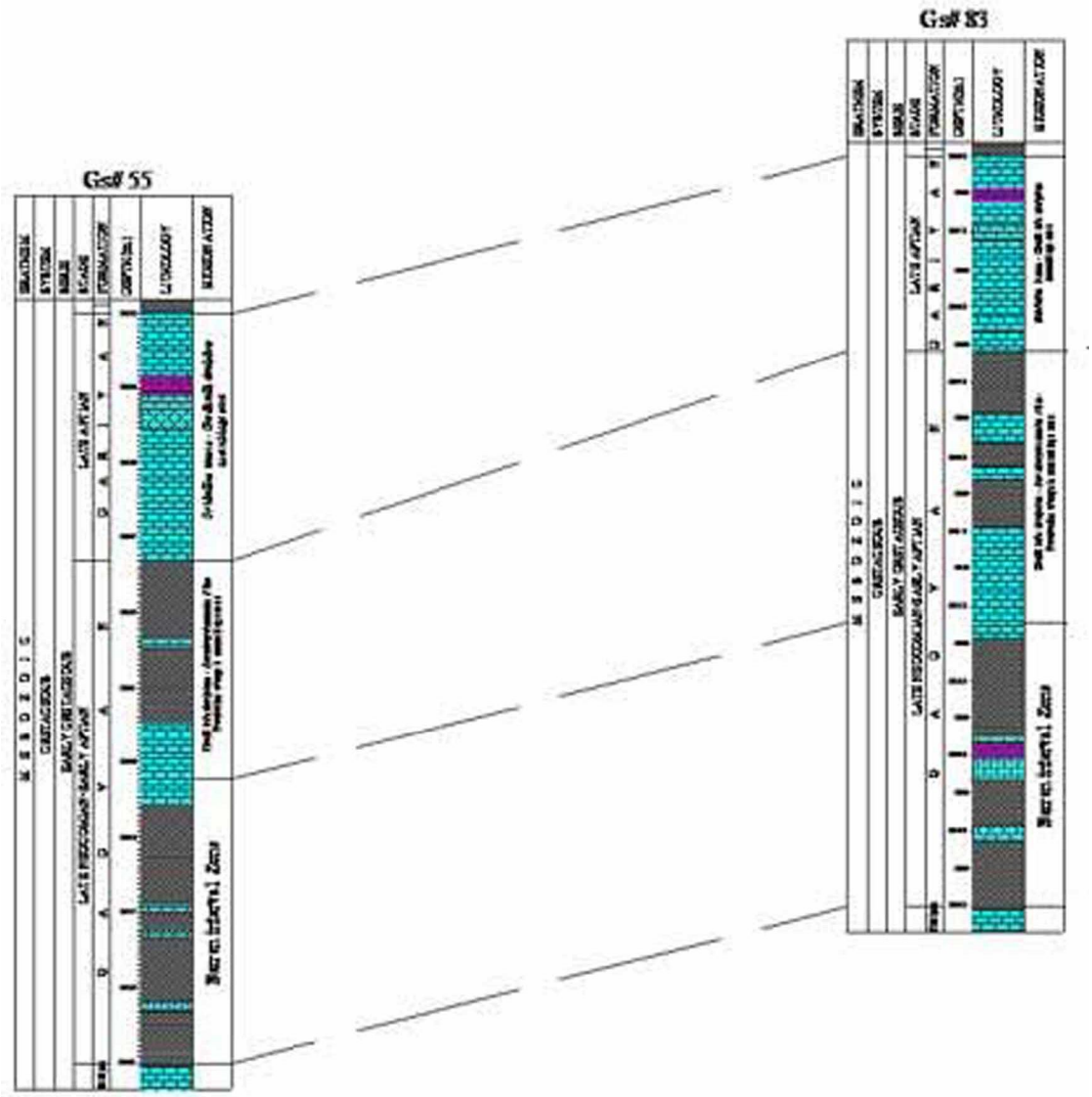

Figure 7- Biostratigraphic correlation of Gadvan and Dariyan formations in Gachsaran oilfield. (wells No. 55 & 83)

6- Conclusion:

Based on conducted studies, including graphic logs, well logging charts and investigation on microscopic thin sections in Gadvan and Dariyan Formations, the following results have been obtained:

1- Thickness of Gadvan Formation in wells number 55 and 83 of Gachsaran is 80 and 74 meters respectively, which is made of three members: lower shale, Khalij limestone and upper shale. In lower and upper shale of this Formation, some argillaceous limestone and Dolomite interbeds are also observed.

2- Thickness of Dariyan Formation in wells number 55 and 83 of Gachsaran oilfield is 39 and 26 meters respectively. Lithology of this Formation is mostly limestone which is together with argillaceous limestone and Dolomite interbeds.

3- By detailed paleological study in Gadvan Formation, a Barren Intervel Zone in lower shale member with the age of late Neocomian and one assemblage zone named *Choffatella decipiens- Pseudocyclamminas littus – Trocholina elongata* Assemblage Zone in Khalij limestone member and upper shale, with age of early Aptian is introduced. Since this assemblage zone is corresponded to Wynd's number 15 biozone [2], age of Gadvan Formation is late Neocomian-Early Aptian.

4- Based on identified fossils in Dariyan Formation, one assemblage zone named *Orbitolina texana - Choffatella decipiens* Assemblage Zone is introduced. Since this assemblage zone is corresponded to Wynd's number 16 assemblage zone, age of Dariyan Formation is late Aptian.

Acknowledgment

The authors declare that they have no conflicts of interest in this research.

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