

Qualitative and quantitative study of the microfacies of the Asmari Formation Bavan Section in northwest Shiraz

Mohammad Sadegh Dehghanian^{1*}, Khosro Khosrotehrani¹, Massih Afghah², Farideh Keshani³

¹ Department of Geology, Science and Research Branch, Islamic Azad University, Tehran, Iran

² Department of Geology, Shiraz Branch, Islamic Azad University, Shiraz, Iran

³ Geological Survey of Iran, Tehran, Iran

Msadeghdehghanian@gmail.com

Abstract: In this study a stratigraphy section of Asmari Formation is selected from Bavan Mountain-in Fars province,Iran- and 401.5 meter of this Formation's sediment is studied in total. Its index microfacies are carefully determined through studying of 152 thinsections. This research shows that the index microfacies in the studied sections are Mudstone, Wackestone, Packstone, Grainstone and the amount of microfacies elements such as bioclast, pellet, extraclast and intraclast are varied in different parts of the studied section and totally the amount of bioclast in the section is more than other elements.

[Mohammad Sadegh Dehghanian¹, Khosro Khosrotehrani¹, Massih Afghah², Farideh Keshani. Qualitative and quantitative study of the microfacies of the Asmari Formation Bavan Section in northwest Shiraz. Researcher. 2011; 3 (10): 36 – 40] (ISSN: 1553-9865). <http://www.sciencepub.net/researcher>.

Keywords: Qualitative and quantitative study, Asmari Formation, Bavan section, Shiraz, Fars, Iran.

1-Introduction

Carbonate Asmari Formation (Oligocene-Miocene) is the most important reservoir rock of Iran Southwest oil fields. It also has a world-wide reputation among the oil geologists. In this research the organic elements existing in the microfacies has been studied qualitatively and quantitatively. It is proven through the quantitative and qualitative research that the index microfacies of Asmari Formation are Mudstone, Wackestone, Packstone, Grainstone. These microfacies have been studied on the basis of orthochem and allochem elements, their percentages, and their texture in the stratigraphy section (Danham 1962).

The first essay on Asmari Formation has been written by H.G.Busk and H.T. May (1918).The above-mentioned researchers named their studied finding as 'Asmari' and determined its age. R.K.Richardson(motiei,2003) measured the Type section of this Formation in Tang-e Gel-e Torsh for the first time. (motiei, 2003) Then Iran National Oil Company carried out a research on Zagros and issued its findings as 'Stratigraphic nomenclature of the Iranian oil consortium agreement area', according to this research Farat and Jorib Formation in Iraq and Khamir Limestone in Fars area have been considered as equivalent and introduced Kalhor sediments and Ahwaz sandstone as the 'Member'(motiei, 2003).J.G.Wynd(1965) studied biostratigraphy specifications of Asmari Formation and determined six zones of accumulation in it. Adams T.D. and Bourgeois F. (1967) issued their integrated research on Asmari Formation as 'Asmari Biostratigraphy'. They achieved three important results 1-Introduction of triple division of Asmari

stratigraphy time as the stratified rock division 2-reject the Deltaic resource for Ahwaz sandstone3-complement the research which has been done by James and Wynd(1965).Some other researches has been done on this matter , and finally J.Stoclin and A.Setudehnia issued their findings as 'Stratigraphic lexicon of Iran' in the second edition of their article. Also, Homayon Motiei edited and issued the second edition of his book, geology of Iran (Stratigraphy of Zagros).Because of the development of oil discoveries in Iran and the significant impact of Asmari Formation as the most important oil reservoir rack of Iran, a lot of researches has been done on it, mostly on Dasht-e khozestan area as an oil land (southwestern of Iran).A brief of these researches are as follows:

Biostratigraphy Study: H. de Boeck, et al (1929), G.M Lces (1933), Bozorgnia.F and Kalantari.A. (1965). Kalantari,A. (1976), Rahaghi.A. (1976), Rahaghi.A. (1978), Kalantari,A. (1980) Amirshahkarami.M, Taheri.A. (2010). Amirshahkarami.M. et al. (2010)Shafieeardestani,M. (2010).

Sedimentary Environmental and Microfacies Study: Maghsodi Gharebalagh, et al. (2005), Mohseni.Hassan, et al. (2006), Vaziri-Moghaddam.Hossein, et al (2006), Ranjbaran.Mohsen, et al. (2007), Ehrenberg.S.N.et al. (2007), Amirshahkarami.Mahnaz, et al. (2007), Bahrami.M. (2009), Taheri.A. (2010), Vaziri-Moghaddam,Hossein. et al (2010).

Tectonic study: Sepehr.M. Cosgrove.J.W. (2004), Bosold, A, et al. (2005), Alavi.Mehdi., (2007), Heydari.Ezat (2008), Khoshbakht.F., et al (2009).

Petroleum Geology Study: Mojudi, M., et al., (2001), Ghofrani, E., (2001), Bordenave, M.L., (2002), Mehdipour, Z., Amini, A., and Rezaee, M.R., (2003), Rahimi, M., et al., (2004), Rezaee, M.R., et al., (2005), Ahmadi, A., et al., (2005).

2-Research methodology:

In this research, Danham (1962) Nomenclature method has been used to name sedimentary facies and the researches of Afghan.M and Dehghanian.M.S.(2007), Flügel (1984), Adams,A.E.,Makenzi,W.S. and Quilford,C.,(1984) has been used to do qualitative and quantitative research on microfacies.

3-Geographic position and area of the studied stratigraphy section:

Bavan stratigraphy section is located in Fars province, northwest of Shiraz city (figure 1), geologically It is located in zone of Zagros folded structure and in Fars area. (James,G.A. & Wynd, J.G. 1965) (figure 2).In the studied section, this Formation is located on the section of Pabdeh shale Formation and is covered by Gachsaran evaporate Formation.

5-Stratigraphy description of the studied section:

This stratigraphy section is located near Bavan village far 97 km from northwest of Shiraz. Upper and lower of Asmari Formation is allied with Pabdeh and Gachsara Formations.

Asmari Formation thickness is 401.5 meter in this section. As it is shown in figure 2, the microfacies existing in this section are

Mudstone, Wackestone, Packstone, Grinstone. The end part of Pabdeh Formation which is located in upper part of Asmari section ends with Packstone facies. Distribution curve of bioclast in the lower part is varied and this shows its abundance in compare with plate, extraclast and intraclast.

The continuous changes of bioclast abundance in lower parts are more, and the maximum abundance of bioclasts is 35% and the minimum amount of them is repeated in different parts of the section. The maximum amount of plate exist in the sample Ba98 which is 25%. The maximum amount of intraclast and extraclast are observed in the samples Ba44, Ba47 which are 10% and 5% in sequence. Meanwhile, in most cases the changes curve of Bioclast and pellet is convergent, the changes curves of bioclast and intraclast is convergent. So, the changes curve of intraclast and plat is convergent in most cases.

4- Results:

-In the beginning of the study section, more changes in Allochem elements is observed which shows the continuous changes in sedimentary zone, and the main reason for this changes is that shale Pabdeh Formation is gradually changing to the carbonate Asmari Formation. This change will be less in the end of the study section.

-The convergence of Allochem elements' change curve shows the changes of sedimentary zone has equally impacted on these elements.

-The most observed facies are Wackestone and the less one are Packstone, and totally the facies related to the less-energetic conditions (Mudstone & Wackestone) are dominated to the more-energetic facies (Packstone & Grinstone).

-Asmari Formation is one of the major oil reservoirs rocks in the Middle East and in the studied section is located on the shale of Pabdeh Formation which is one of the most important source rocks. Its upper part covers with Gachsaran

Formation which has evaporative facies and is the most important and best oil Cap rock in Iran. This sequence could have the potential of creating hydrocarbon

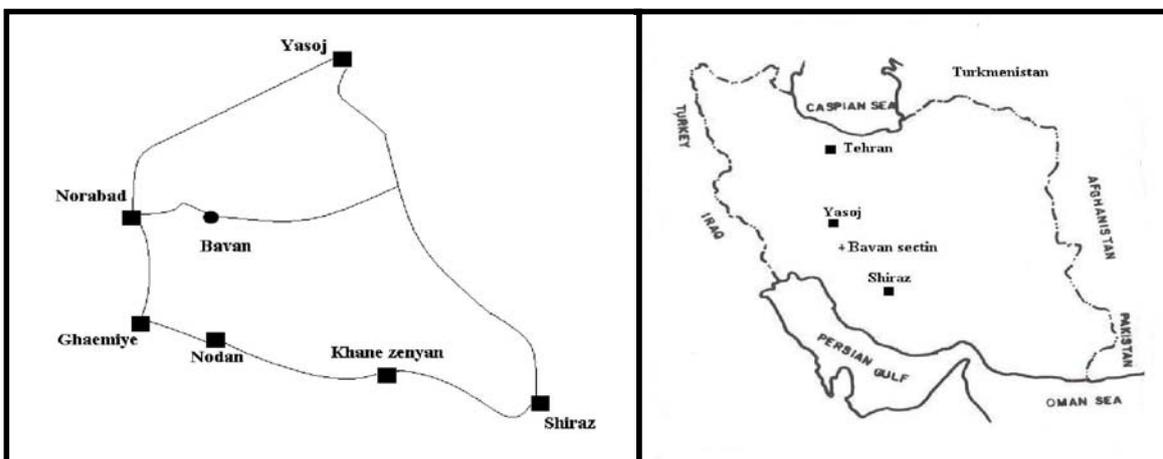


Figure1- Map showing the location of the study areas in Southwest Iran

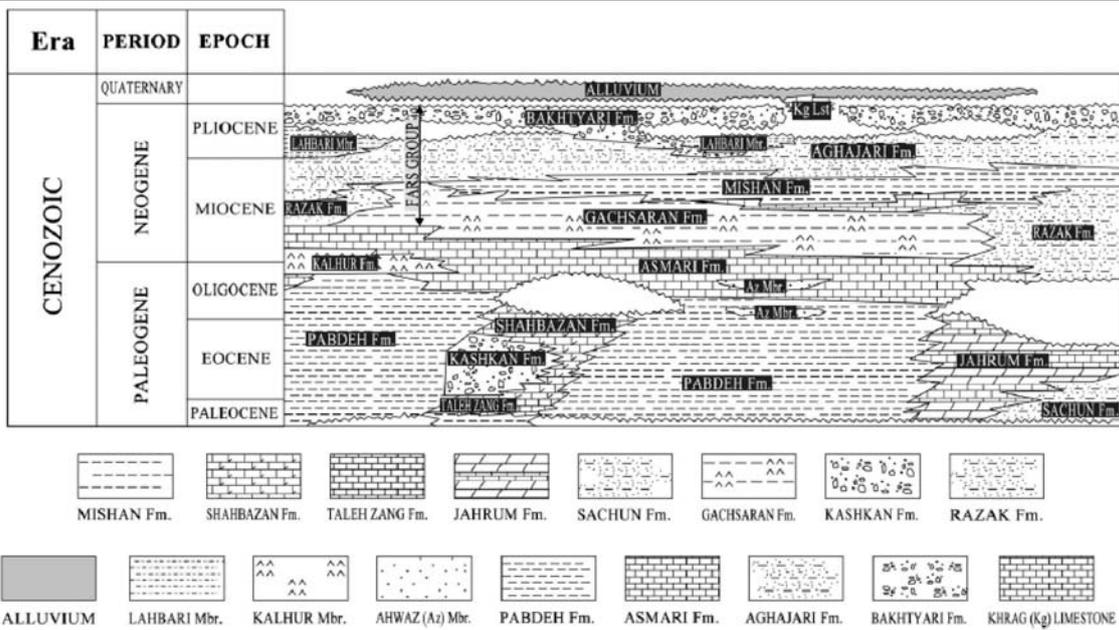


Figure 2- Schematic section showing the stratigraphic position of the Asmari Formation within the Cenozoic rocks of southwestern Iran (Motiei 2001) (Vazirimoghdam et al. 2010).

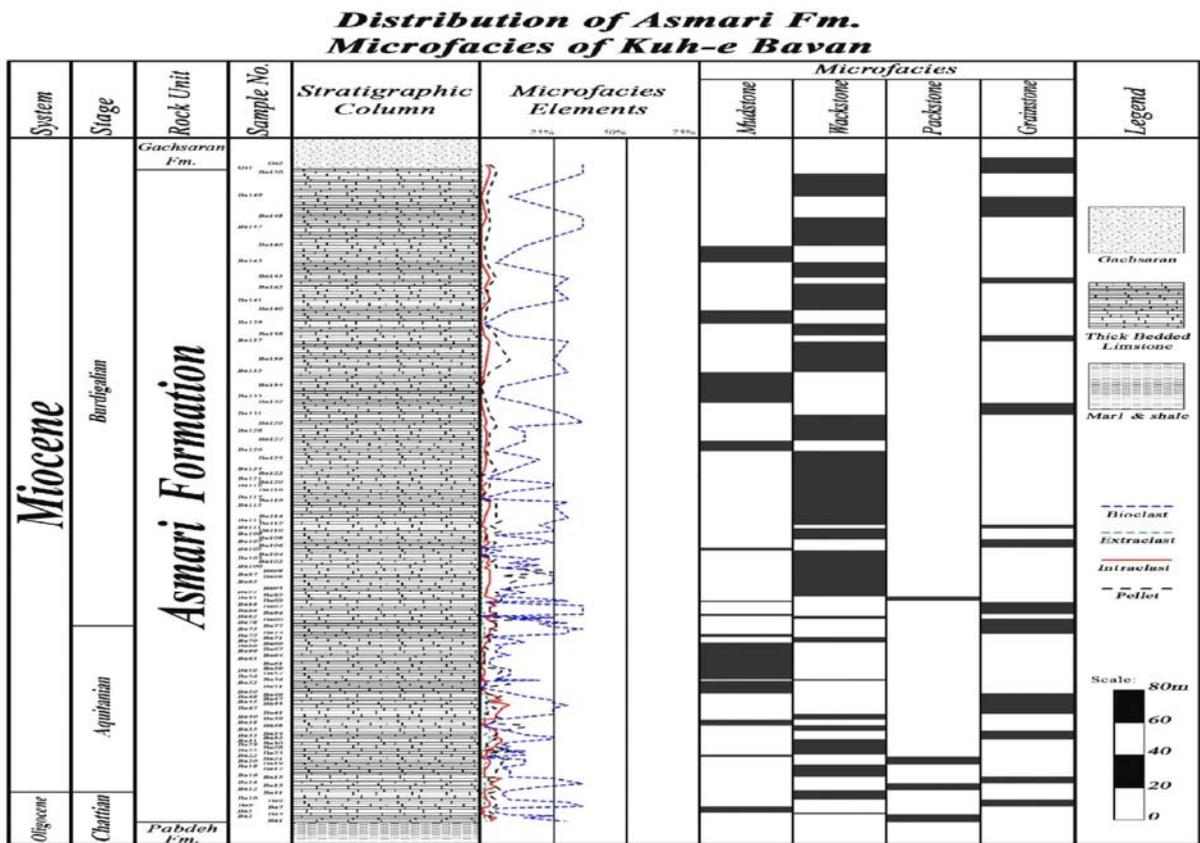


Figure 3-Shows the distribution of stratigraphy and carbonate microfacies and its elements

.- A lot of oil studies about exploiting of hydrocarbon resources has been done on Dasht-e Khozestan (southwest of Iran). Meanwhile, some other areas of Iran such as Fars province can have the hydrocarbon potential.

5- References:

- [1] Adams, A.E., Makenzi, W.S and Guilford, C., (1984). Atlas of sedimentary rocks under the microscope, Longman Scientific and Technical.
- [2] Adams, T.D. and Bougeois., (1967). Asmari Biostratigraphy. Iranian Oil Operating Companies Geological and Exploration Division.
- [3] Afghah, M. and Dehghanian, M.S (2007). Qualitative and quantitative study of the microfacies of the Sarvak Formation Kuh-e Khane-kat and Kuh-e Shah-Neshin Section in Fars provinces. Applied Geology. No.1 p.7-16.
- [4] Ahmadi, A., Rezaee, M.R., Moalemi, S. A., and Fahmi, H., (2005). Determination of rock types for Asmari Formation from wire line logs using Fuzzy logic in one of the Iranian oil field. Proceeding of 9th symposium of geological society of Iran, August 2005, P. 736-737.
- [5] Alavi, Mehdi., (2007). Structures of the Zagros Fold-Thrust belt in Iran, American journal science, Vol:307, P.1064-1095.
- [6] Amirshahkarami, Mahnaz, Vaziri-Moghadam, Hossein, Taheri, Azizolah., (2007). Sedimentary facies and sequence stratigraphy of the Asmari Formation at Chaman-Bolbol, Zagros Basin, Iran, By., Journal of Asian Earth Sciences 29.PP.947-959.
- [7] Amirshahkarami, Mahnaz, Vaziri-Moghadam, Hossein, Taheri, Azizolah., (2007). Paleoenvironmental model and sequence stratigraphy of the Asmari Formation in southwest Iran. Historical Biology, 2007; 19(2): 173-183.
- [8] Amirshahkarami, Mahnaz, Taheri, Azizolah., (2010). Biostratigraphy characterization of the Rupelian-Burdigalian carbonate succession at the Chaman-Bolbol area in the Zagros Basin. Stratigraphy and Sedimentology. 26th year, vol.40, No.3, Autumn 2010. Pp.119-136.
- [9] Amirshahkarami, M., Ghabishavi, A., Rahmani, A. (2010). Biostratigraphy and Paleoenvironment of the larger benthic foraminifera in wells sections of Asmari Formation from the Rag-e-Safid oil field, Zagros Basin, southwest Iran. Stratigraphy and Sedimentology. 26th year, vol.40, No.3, Autumn 2010. pp.63-84-136.
- [10] Bahrami, M., (2009). Stratigraphy, Microfacies and sedimentary environments of Asmari Formation at Tang-e-Bolhayat, North of Kazerun, Fars province, Iran, Geophysical Research Abstract, Vol.11, EGU2009-4728 2009.
- [11] Boeckh, H. de Lees, G.M and Richardson, F.D.S., (1929). Contribution to the stratigraphy and tectonics of the Iranian ranges: The structure of Asian, Edited by J.W. Gregory London, p.58-177.
- [12] Bordenave, M.L., (2002). The Middle Cretaceous to Early Miocene Petroleum System in the Zagros Domain of Iran, and its Prospect Evaluation. AAPG Annual Meeting March 10-13, 2002 Houston, Texas.
- [13] Bosold, A, et al. (2005) The structural geology of high central Zagros revisited (IRAN). Petroleum Geoscience, Vol11, PP225-238.
- [14] Bozorgnia, Fathollah and Kalantari, Amir. (1965). Nummulites of Parts of Central and east Iran. (A Thin-section study). National Iranian Oil Company. Geological Laboratories.
- [15] Busk, H.G., and Mayo, H.T. (1918). Some notes on the geology of the Persian oilfield: Journ, Inst. Of Petrol. Tech., v.5, No.17, p.5-26.
- [16] Dunham, R.J. (1962). Classification of Carbonate Rocks According to Depositional Texture in Classification of Carbonate Rocks, Sympo A.A.P.G
- [17] Ehrenberg, S.N., H.Pickard, N.A., Laursen, G.V., Monibi, S., Mossadegh, Z.K., Svana, T.A., Aqrabi, A.A., McArthur, J.M. and Thirlwall, M.F. (2007). Strontium Isotope stratigraphy of the Asmari Formation. (Oligocene-Lower Miocene), SW Iran. Journal of Petroleum Geology, vol.30(2), April 2007, PP.107-128.
- [18] Flügel, Erik (2004). Microfacies of Carbonate Rocks (Analysis, Interpretation and Application). Springer-Verlag, Tiergartenstrasse .
- [19] Ghofrani, E, Rezaee, M.R., Okhravi, R., Ghalavand, H., and Samimi, B., (2001), Reservoir quality evaluation of the Asmari Formation, Ahwaz Field (eastern part). Proceeding of 5th Symposium of Geological Society of Iran, Aug 28-30, p. 534.
- [20] Heydari, Ezat (2008). Tectonics versus eustatic control on supersequences of the Zagros Mountains of Iran. Tectonophysics 451 (2008) 56-70.
- [21] James, G. A., Wynd., J. G. (1965). Stratigraphic Nomenclature of the Iranian Oil Consortium Agreement Area. A. A. P. G, 1.
- [22] Kalantari, Amir (1976). Microbiostratigraphy of the Sarvestan Area, Southwestern Iran. National Iranian Oil Company. Geological Laboratories. Publication No.5.
- [23] Kalantari, Amir. (1980). Tertiary Faunal Assemblage of Qum-Kashan Sabzevar and Jahrum

areas. National Iranian Oil Company. Geological Laboratories. Publication No.8.

[24] Khoshbakht.F., Memarian.H., Mahammadnia.M., (2009). Comparision of Asmari, Pabdeh and Gurpi Formation'S fracture, derived from image log, Jornal of Petroleum science and Engineering 67(2009) 65-74.

[25] Lees.G.M. (1933). Reservior Rocks of Persian oil fields. AAPG, Bulletin. P.229.

[26] Maghsodi Gharebalagh, F., Rezaee, M. R., and Jahani, D., (2005). Effect of the microfacies, sedimentary environment and diagenesis on the reservoir quality of the Asmari Formation in the Gachsaran oil field. Proceeding of 9th symposium of geological society of Iran, August 2005, P. 682-698.

[27] Mehdipour, Z., Amini, A., and Rezaee, M.R., (2003). Delineation of Asmari Reservoir Zones from 3-D seismic data, Shadegan Field. Proceeding of 7th Symposium of Geological Society of Iran, Aug 26-28, pp. 345-352.

[28] Mohseni.Hassan, Khodabakhsh.Saeed, Mohammadi.Reza, Yarmohammadi. Afshin and Sadeqgi.Gholamreza. (2006). Sequence Stratigraphy of Asmari Formation in the Zagros Basin (SW Iran), Implication for Reservoir Porosity Predication. Geo2006. Middle East conference and Exhibition: 27-29 March, 2006, Manama Bahrain.

[29] Mojudi, M., Rezaee, M.R., Okhravi, R., and Ghalavand, H., (2001).The effect of diagenetic processes on the reservoir quality of the Asmari Limestone, West Ahwaz Field, Zagros Basin, South Iran. South Iran. Proceeding of 5th Symposium of Geological Society of Iran, Aug 28-30, p. 545.

[30] Motiei H. (2003). Geology Of Iran (Stratigraphy of Zagros). Report No:84. Geological Survey of Iran.

[31] Rahaghi,Akbar. (1976). Contribution A L etude de quelques grands foraminifères de L Iran (Part1-3). National Iranian Oil Company. Geological Laboratories. Publication No.6.

[32] Rahaghi,Akbar (1978). Paleocene Biostratigraphy of some parts of Iran. National Iranian Oil Company. Geological Laboratories. Publication No.7.

[33] Rahimi, M., Rezaee, M.R., Kazemzadeh, E., Saadat, K., (2004). Determination of Archie coefficient (m & a) and their various data processing for Asmari Formation, for one of the southern Iranian oil field, Geological Survey of Iran.

[34] Ranjbaran.Mohsen, Fayazi.Farajollah and Al-Aasm.Ihsan.(2007). Sedimentology, Depositional environment and sequence stratigraphy of the Asmari Formation (Oligocene-Lower Miocene), Gachsaran area, SW Iran. Carbonates and Evaporites, v. 22, no. 2, 2007, p. 135-148.

[35] Rezaee, M.R., Kazemzadeh, E., and Rahimi, M., (2005). Determination of the Archie's parameters for different facies of Asmari Formation, Gachsaran Field. Research and Development of NIOC confidential Report, 170 pp.

[36] Richardson, R.K., (1928). Weiter Bemerkungen Zu der Geologie und dem Salzaufbruch am Persischem Golf Zentrabit. Min.etc Abt B,p.43-49.

[37] Sephehr.M., Cosgrove.J.W. (2004). Structural framework of the Zagros Fold-Thrust Belt, Iran. Marine and Petroleum Geology 21 (2004) 829-84.

[38] Shafieeardestani,Maysam., (2010). Biostratigraphy of Asmari Formation in marun oilfield (well no.339).Geophysical research Abstract vol.12,EGU2010-1807-2010.

[39] Stocklin.J. and Setudehnia.A. (1991) Stratigraphic Lexicon of Iran. Geological Survey of Iran . Report No.18.

[40] Taheri.A. (2010). Paleoenvironmental model and sequence stratigraphy for the Oligo-Miocene foraminiferal limestone in east of Dogonbadan. Stratigraphy and Sedimentology. 26th year, vol.40,No.3, Autumn 2010. pp.15-30.

[41] Vaziri-Moghaddam.Hossein, Kimiagari.Masoud, Taheri.Azizolah (2006). Depositional environment and sequence stratigraphy of the Oligo-Miocene Asmari Formation in SW Iran. Facies (2006) 52: 41-51 DOI 10.1007/s10347-005-0018-0.

[42] Vaziri-Moghaddam,Hossein., Seyrafian.Ali., Taheri,Azzolah and Motiei,Homayoon. (2010). Oligocene-Miocene ramp system (Asmari Formation) in the NW of the zagros basin, Iran: Microfacies, paleoenvironmental and depositional and depositional sequence. Revista Mexicana de ciencias Geologicas, v.27, num.1,2010,p.56-71.

[43] Wynd.J.G. (1965). Biofacies of the Iranian oil consortium agreement area. Iranian oil operating and exploration division. Tehran November 1965. Report no.1082.