

Microbiostratigraphy and Paleoecology of bentic foraminifers study based on the Microfacies and Sedimentary Sequence identification and interpretation in Asmari Formation of South- East of Shiraz (Fars province)

Dr. Vahid Ahmadi , Asma Motaharian*

Department of Geology, Faculty of Science , Islamic-Azad University, Shiraz

Islamic Azad University-Shiraz Branch, Young researcher club of Shiraz*
(09173088288)asmamotaharian@yahoo.com

Abstract

In this research , two stratigraphic sections were chosen from Asmari Formation . These sections include Shamsabad and Runiz plus 280 meters. For this investigation 251 thin-sections were prepared and 14 samples analysed by XRF. We studied paleobiotope that includes biozone and sedimentary sequence . These index biozones and percentage of elements that appear in paleobiotope are identified . Principally index bentic foraminifers , identified in the studied sections , are listed below :

Nummulites fichteli , Nummulites intermedius, Nummulites vascus, Spiroclypeus ranjanae , Rotalia viennotti , Pearhapydionina delicata , Austroterillina howchini, Peneroplis evolutus , Peneroplis thomasi , Archaias sp., Pyrgo sp. , Archaias krikukensis , Valvulinid sp. , Spirolina cylindracea , Triloculina trigonula , Borelis melo , Meandropsina iranica , Dendritina rangi , Peneroplis sp. , Austroterillina sp. , Borelis sp. , Meandropsina anahensis , Triloculina tricarinata , Valvulinid sp.1 , Valvulinid sp.2, Miliola sp .

Based on aforementioned foraminifers , the age of studied sediments is Oligocene to early Miocene and also three, biozones have been identified for these sediments . Regarding the frequency , sedimentary sequence (parasequence and system tract) , type of wall and paleobiotope percentage ratio of each foraminiferal biozone , there are different paleobiotopes that indicate change in the trend of paleoecologic conditions of Asmari formation .

Keywords: *Biozone; Paleobiotope; Sedimentary Sequence; Foraminifer; Asmari Formation;*

1- Introduction

the Asmari Formation in Fars region overlays the Jahrum Formation with an erosional disconformity. The first time, the type section of Asmari Formation has been studied by R.K.Richardson (1924) in the strait of Goltorsh. In the type section exists only middle and upper part of Asmari Formation. The age of Asmari Formation has been said Oligocene to Burdigalian by Thomas (1948). And the Asmari Formation has been divided by three part, lower Asmari with the Oligocene age , middle Asmari with the Aquitanian age of Miocene and upper Asmari with the Burdigalian age of Miocene. The lithology of this Formation consists of cream to brown limestone with the fossil shell and the thickness of the sediments is 314 m.(Motiei 1372, Khosrotehrani 1384, Darvishzade 1385)

2- Geographical situation of the studied stratigraphic sections

The studied stratigraphic sections are situated in South- East of Shiraz (Fars province). we can approach it through the main road of Shiraz-Estahban. The geographic coordinates of Runiz section is N 29°, 19' – E 53°, 25' and The geographic coordinates of Shamsabad section is N 29°, 13' – E 53°, 23' .

3- Introducing Biozonation of the studied stratigraphic sections

Actually, in the studied stratigraphic sections, three biozones have been determined for benthos foraminifers in the sediments of Upper Oligocene (Chatian) to Lower Miocene (Burdigalian) which are as follow:

(James and Wynd ,1965) (Adames and Bourgeois ,1967) (Loblich and Tappan ,1988) (Rahaghi ,1983) (Thomas, 1948) (Khosrotehrani 1386).

3-1- Biozone No. 1 - *Nummulites fichteli* – *Nummulites intermedius* – *Nummulites vascus* assemblage - zone

The thickness of this biozone in Shamsabad section is 56 m. and in Runiz section is 25.5 m. and its microfossils includes: *Pearhapydionina delicate* , *Spiroclypeus ranjanae*, *Rotalia viennoti* , *Ditrupa* sp. which indicates the age of Chatian. According to Thomas 's definition, this assemblage zone is equivalent to lower Asmari.

3-2- Biozone No. 2 - *Austroterillina howchini* – *Peneroplis evolutus* assemblage – zone

The first time, this assemblage zone has been recognized by Wynd (1965) and according to division of Thomas, it is equivalent to middle Asmari (Aquitania) and its phonetic contents includes: *Peneroplis thomasi* , *Archaias* sp. , *Pyrgo* sp. , *Archaias krikukensis* , *Valvulinid* sp., *Spirolina cylindracea* , *Triloculina trigonula* . The thickness of this biozone in Shamsabad section is 46 m. and in Runiz section is 49 m.

3-3- Biozone No. 3 - *Borelis melo group* – *Meandropsina iranica* assemblage – zone

This assemblage zone is equivalent to *Borelis melo group* – *Meandropsina iranica* assemblage – zone (Adames and Bourgeois ,1967) and according to division of Thomas, it is equivalent to upper Asmari (Burdigalian). its microfossils contents includes: *Dendritina rangi* , *Valvulinid* sp. , *Pyrgo* sp. , *Triloculina trigonula* , *Peneroplis* sp. , *Rotalia viennotti* , *Austroterillina* sp. , *Borelis* sp. , *Meandropsina anahensis*. The thickness of this biozone in Shamsabad section is 45 m. and in Runiz section is 58.5 m.

4- Description of Sequence Stratigraphy and microfacies of Asmari Formation in the Studied Stratigraphic Sections

Actually, based on the sequence stratigraphic studies, the studied sections of (Shamsabad and Runiz) includes two 3rd order sediment sequence and 6 facies groups is recognized.

4-1- Sediment sequence 1

The age of this sequence is Chatian to Aquitania and it consists of lower and middle part of Asmari Formation . lower boundary of SB1 type is placed on Jahrum Formation and upper boundary of SB2 type is in the end of middle part of Asmari Formation .the thickness of this

sediment sequence in Runiz section is 75.5 m. and in Shamsabad section is 102 m. Maximum flooding surface (mfs) in studied sections is Wackestone-Packestone Bioclastic with Crinoid shelf, Gastropoda, Ostracoda, Bryozoa, spine Echinoid and foraminifers for example *Pyrgo* sp., *Reusella* sp., *Elphidium* sp., *Amphistegina* sp. This sequence consists of Transgressive System Tract (TST) with open marine facies (fore bar shelf) and Highstand System Tract (HST) with bar and lagoon facies. The thickness of TST in Runiz section is 31m and in Shamsabad section is 26m. Parasequence stacking pattern of TST is a regressive form. The thickness of HST in Runiz section is 45 m. and in Shamsabad section is 76 m. Parasequence stacking pattern of TST is an aggradational form.

4-2- Sediment sequence 2

The age of this sequence is Burdigalian. The thickness of this sediment sequence in Runiz section is 57.5 m. and in Shamsabad section is 45 m. Lower boundary is SB2 type and upper boundary is SB1 type. Maximum flooding surface (mfs) in studied sections is Packestone facies with microfossils for example *Globorotalia* sp., *Triloculina tricarinata*, *Meandropsina* sp. (TST) facies is open marine limestones that the thickness of it in Runiz section is 27m. and in Shamsabad section is 14m. HST consists of shoal and lagoon facies that the thickness of it in Runiz section is 30m. And in Shamsabad section is 31m. (Lassemi, 1980)(Flugel, 2004) (Dunham, 1962). Parasequence stacking pattern of TST and HST show a regressive form. (Fig.1, Fig.2) (Sarg, 1988) (Emery & Myers, 1996) (Sloss, 1963) (Khosrotehrani, 1386)

5- Paleocology

The most abundant rate of foraminifers is in lower part of the studied stratigraphic sections (Biozone No.1). And this amount is decreased in middle and upper part (Biozone No.2 & 3). The variety of species in lower part is more than middle and upper part. The percentage of Na₂O in biozone no.1 is the most amount and this percentage is decreased in biozone no.2 & 3. Increasing in becoming thick of porcelanuse test is the most amount in biozone no.1. In fact, fauna test in order to resist collision of waves to bar is became thick in this biozone. The percentage of Cao and Mgo is decreased. but in biozone no.3, becoming thick Hyalin test is observed for example *Rotalia viennotti*, that in this biozone, the percentage of Mgo and Cao is increased. The most availability of foraminifers with Agglotinate test and Porcelanous test are observed in paleobiotope related to TST, facies and the most availability of foraminifers with Hyaline test is in paleobiotope related to HST facies.

(Fig.3, Fig.4, Fig.5, Fig.6) (Khosrotehrani, 1382) (Zavarei, 1387)

6- CONCLUSIONS

a) Two stratigraphic sections of Runiz and Shamsabad have a lot of similarities in view of biozonation and sequence stratigraphy.

b) Based on the investigation of foraminifers of the studied sections, there are these biozones that have been identified which includes :

Biozone No. 1- *Nummulites fichteli*–*Nummulites intermedius*–*Nummulites vascus* assemblage – zone of Chatian.

Biozone No. 2-*Austroterillina howchini*–*Peneroplis evolutus* assemblage–zone of Aquitanian.

Biozone No. 3- *Borelis melo group* – *Meandropsina iranica* assemblage–zone of Burdigalian. However the age of both stratigraphic sections is from Chatian to Burdigalian.

c) The most availability of foraminifers with Agglotinate test and Porcelanous test were observed in paleobiotope related to TST, facies and the most availability of foraminifers with Hyaline test was in paleobiotope related to HST facies.

d) The lower border of the Asmari Formation (SB1) has been distinctive with an erosion-made disconformity as the result of an Peirnean Orogenic phase operation and the upper border of Jahrum Formation is erosion-made disconformity.

e) According to the biostratigraphic limites of the studied sections, datum line is determined in U.Oligocene (Chatian).

References

- 1- Adams, T. D., and F. Bourgeois., 1967, Asmari biostratigraphy: Geological and Exploration, IOOC Report, p.1074, unpublished.
- 2- Darvishzade, A., 1385, Geology of Iran: published in Kelidar.
- 3- Dunham, R.J., 1962, Classification of carbonate rocks according to their depositional texture. Amer. Assoc: Petrol. Geol., p.1, 108-121.
- 4- Emery, D., & Myres, K.J., 1996, Sequence stratigraphy. Black well scientific: Oxford, p.297.
- 5- Flugel, E., 2004, Microfacies of carbonate rocks, analysis interpretation and application: Springer-Verlag Berlin Heidelberg, p.976.
- 6- James, G.A., and J.C. Wynd., 1965, Stratigraphy nomenclature of Iranian oil consortium agreement area: AAPG Bulletin, p.12, p.2182-2245.
- 7- Khosrotehrani, Kh., 1382, Carbonat Facies: published in Islamic Azad University-Science & Research campus, p.428-450.
- 8- Khosrotehrani, Kh., 1384, Geology of Iran: published in Kelidar.
- 9- Khosrotehrani, Kh., 1386, Applied Micropaleontology: the University of Tehran Press.
- 10- Khosrotehrani, Kh., 1386, Microfacies: the University of Tehran Press.
- 11- Khosrotehrani, Kh., 1386, Atlas of Microfacies: the University of Tehran Press.
- 12- Khosrotehrani, Kh., 1386, Applied Stratigraphy: published in Kelidar.
- 13- Lassemi, Y., 1980, Carbonate microfacies and depositional environment of the Kinkaid Formation (Upper Missisipian) of the Illionis: U.S.A, p.139.
- 14- Loblisch, A.R., & H. Tappan., 1988, Foraminiferal genera and their classification: Van Nostrand Reinhold Company, New York, p.970.
- 15- Motiei, H., 1372, Iran Geology, Iran Stratigraphy: published in Civil Geological Organization, p.331.
- 16- Rahaghi, a., 1983, Stratigraphy and final assemblage zone of Paleocene-Lower Eocene in Iran: N.I.O.C publication, p.1-45.
- 17- Sarg, J.F., 1988, Carbonate Sequence stratigraphy: SEPM Spec, p.155-188.

- 18- Sloss, L., 1963, Sequence in the cratonic interior of North America: Geol Soc.Am.Bull, p.93-114.
- 19-Thomas, A.n., 1948, The Asmari Limestone of southwest Iran: AIOC Report, p.706, unpublished.
- 20-Zavarei,A., 1387, Paleontology: published in Environment.

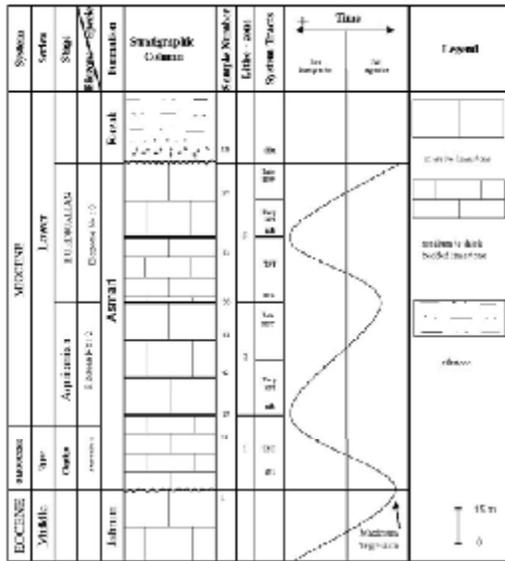


Fig 1: Sequence Stratigraphy description of Runiz stratigraphic section

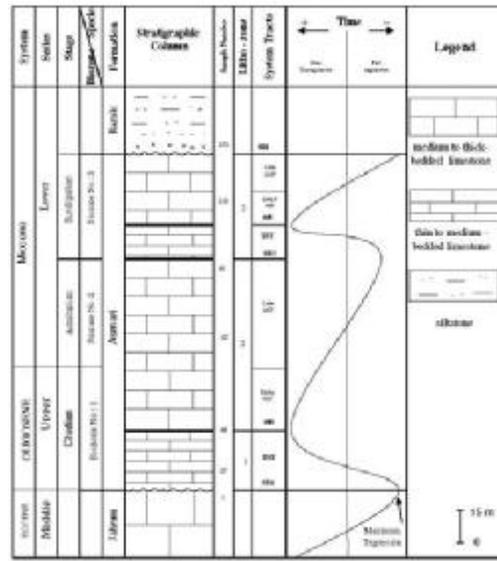


Fig 2: Sequence Stratigraphy description of Shamsabad stratigraphic section

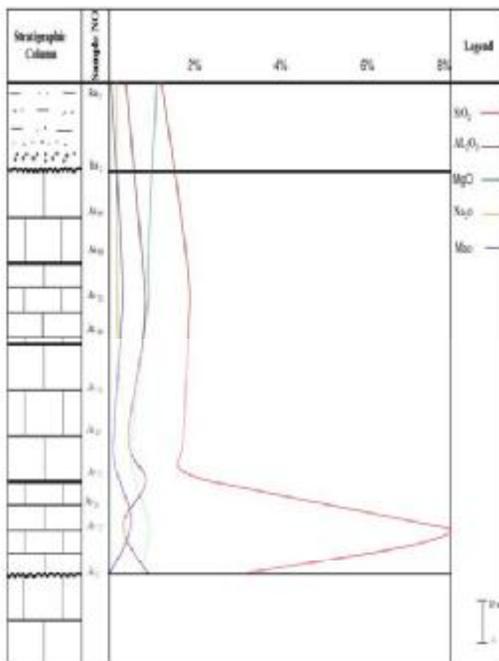


Fig 3: The distribution of index elements in Runiz stratigraphic section sediment

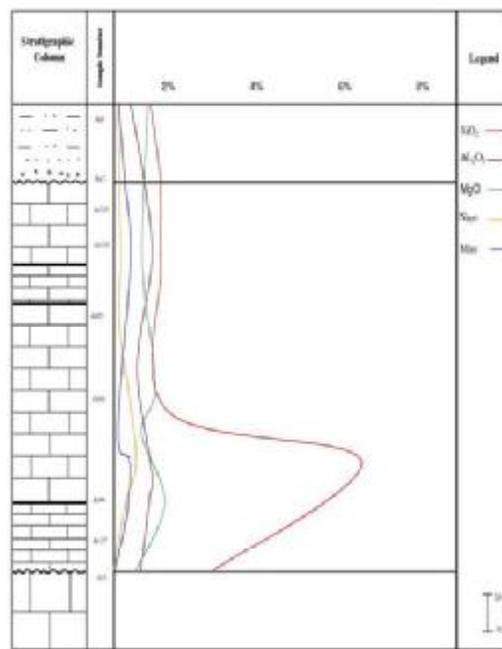


Fig 4: The distribution of index elements in Shamsabad stratigraphic section sediment

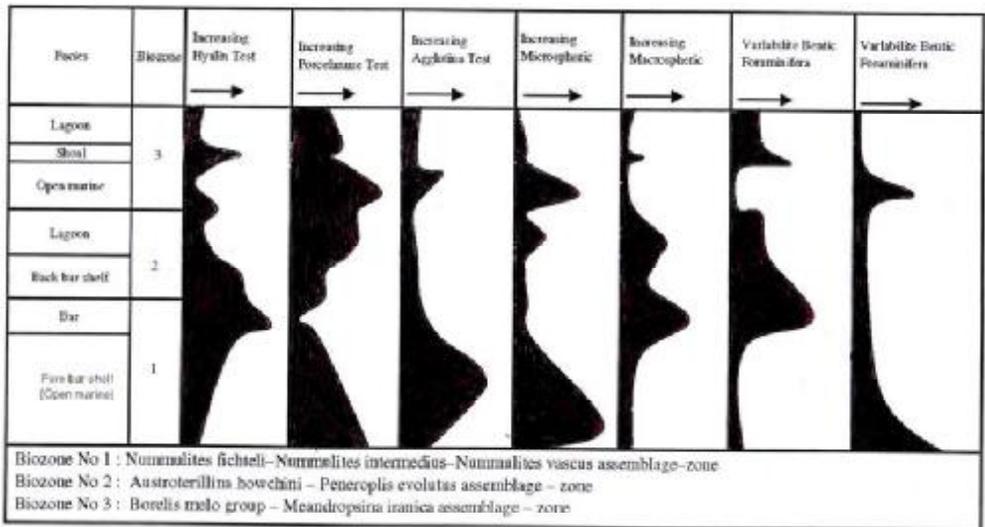


Fig 5: The process of changes in abundant rate of microspheric, megalospheric form, benthic and pelagic foraminifera and changes rate of test kinds of foraminifera in biozones and different facies of the studied stratigraphic sections

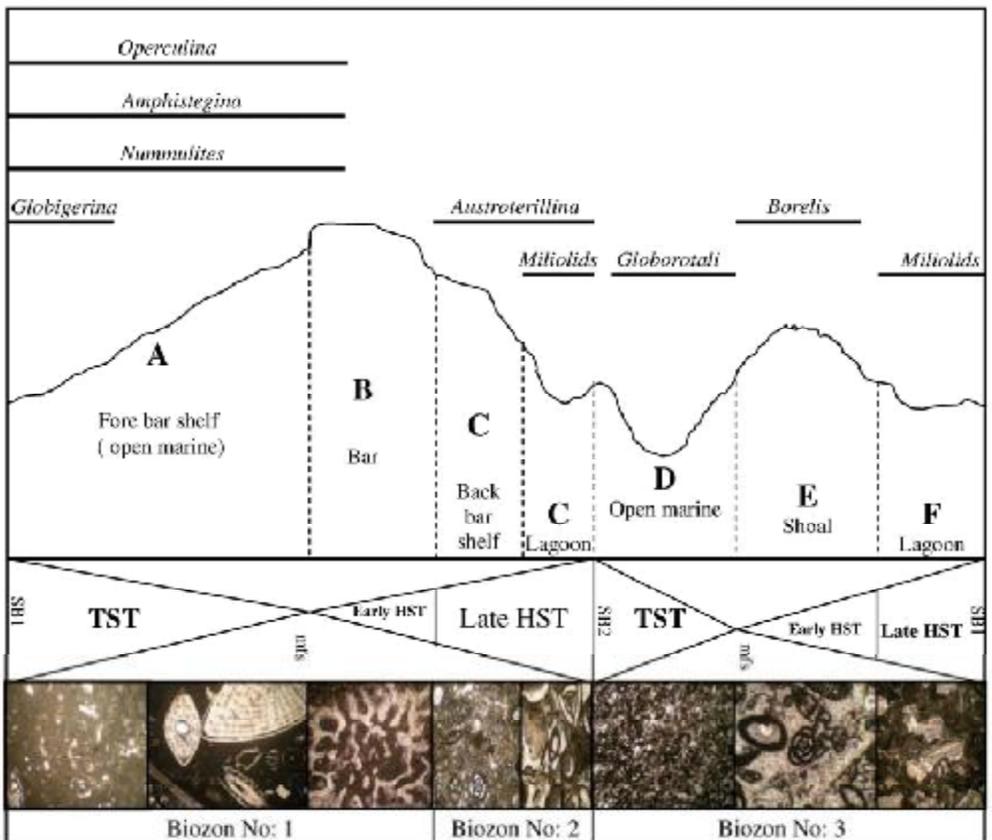


Fig 6 : The block diagram of Asmari Formation sedimentary basin in the studied stratigraphic sections, according to sedimentary facies condition and sequence facies sets condition and biozones