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**MICROBIOSTRATIGRAPHY OF THE EOCENE-OLIGOCENE BOUNDARY IN THE
INTERIOR FARS (FOLDED ZAGROS)**

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ABSTRACT

In this study, microbiostratigraphy of four surface stratigraphic sections and one subsurface stratigraphic section from deposits of Jahrum and Asmari formations in interior Fars region, Zagros folded zone was studied. The collective thickness of Jahrum formation in studied cuts is 921m and the collective thickness of Asmari in studied sections is 596m. In this study the 50 Genus and 39 Species of foraminifera benthic from Jahrum formation and 52 Genus, 35 Species of foraminifera benthic from Asmari formation were identified, which were identified according to vertical diffusion and scattering, 6 biozones related to Jahrum formation with the age Late Paleocene – Late Eocene and 8 biozones related to Asmari with the age of Ruppelian to Burdigalian. Also Jahrum and Asmari (Eocene -Oligocene) formations' border state was examined in studied region from stratigraphy viewpoint, which is in most studied sections in the form of erosional unconformity, and can be considered equal to Pyrenean orogenic phase performance.

Keywords: Microbiostratigraphy, Asmari Formation, Jahrum Formation, Biozone

INTRODUCTION

Paleocene-Oligo Miocene deposits in studied Asmari formations. Jahrum and Asmari regions are covered by both Jahrum and formations in studied regions consist of

limestone and dolomitic [1]. Asmari formation is the thick carbonate séance of Oligo Miocenewhich is considered the hydrocarbon genera reservoir rockin Zagros depository range. The type section of Asmari formation in Gol-e Torsh gorge in Asmari anticline contains 314m limestone, dolomitic limestone, dolomitic and Marli limestoneis in Lorestan province scope in an uncut state with Shahbazan formation and is known as Shahbazan Asmari. The former (Ruppelian) age is considered for this formation according to the dispersion of benthic foraminifera and stratigraphy strontium Isotope [2].

Biozonation of Asmari formation was for the first time introduced according to reports published by Wynd and Adams and Bourgeois and the same Biozonation was the basis for later studies by Seyrafian & Hamedani, 1998; Seyrafian, 2000 Vaziri-Moghadam *et al*, 2006; Amirshahkarami *et al*, 2007 a, b; Daneshian & Nana, 2007. The last published article about Asmari formation's biozonation was presented by Larsen *et al* (2009). The main objective of this research was performing fine microbiostratigraphy studies in order to examine Eocene – Oligocene border in thestudied region. In order to determine the existent biozones, Adams and Bourgeois (1967) and Larsen *et al*. are used, and the results are compared to

presented biozonation by Ehrenburg *et al*. (2007) [4]. At first, Jahrum and Asmari formations' scope were examined in studied regions and four surface stratigraphic cuts and one subsurface section are chosen. Regarding lithology characteristics and facies changes in this cuts, 1000 samples are taken and thin sections were made from them. These sections were examined from lithological and paleontological viewpoints in order to determine the relative age of Asmari carbonate sequence, and that of Jahrum formation and identifying microfacies. The collective thickness of Jahrum formation is 921m and Asmari formation 596m, which is categorized according to layers thickness and the distribution between Marli and lime layers.

The Geographical Situation of the Studied Region

The studied surface and subsurface stratigraphic sections are located in stratigraphic Zagros zone. Geographical coordinate and stone stratigraphy of studied surface and subsurface stratigraphic sections is as show in **Figure 1**, also the stone stratigraphy of Jahrum and Asmari formations in Fars region is as show in **Figure 2**. Bador Bahman surface section stratigraphy, is located 160km from Shiraz, Ab morghan surface section stratigraphy, 15km from

Shiraz south-west side, Asef Mountain surface section stratigraphy, 45km from Shiraz, Kharman Mountain surface section stratigraphy, 150km from Shiraz, and Sarvestan oil well surface section stratigraphy, 85km from Shiraz (**Figure 3**).

Biostratigraphy

In order to present biozonation, Jahrum and Asmari formation's border and age in studied surface and subsurface stratigraphic sections, 1000 thin sections were closely investigated. Based on vertical diffusion and distribution of existent Foraminifera in Jahrum and Asmari formations in studied surface and subsurface stratigraphic sections, 6 biozones were identified as related to Jahrum formation with Late Paleocene age to Late Eocene, and 8 biozones related to Asmari formation with Ruppelian to Burdigalian age. Determining the studied formations' biozones is performed according to biozones presented by Adams and Bourgeois (1967) and Larsen *et al.* (2009) and James and Wynd (1965). The identified biozones of 5 studied surface and subsurface stratigraphic sections are as follows:

According to microbiostratigraphy studies, the existence of genera and species existent in 3 biozones (Jahrum formation) and 4 biozones (Asmari formation) was identified in

Badorbahmansurfacestratigraphicsection (**Figure 1**).

Biozone 1: *Miscellanea-Kathina* assemblage zone. This biozone's thickness in Jahrum formation of Bador bahman stratigraphic section is 50m. Its Faunistic accumulation includes: *Fallotella alavensis*, *Nummulites* sp., *Lockartina* sp., *Orbitolites shirazensis*. Regarding the fossilic content, the age of this biozone is Late Paleocene, and corresponds to biozone 43 Wynd (1965). This biozone corresponds to Jahrum formation lower Lithostratigraphic unite in Bador bahman surface stratigraphic section [7].

Biozone 2: *Opertorbitolites* Acro Zone

This biozone includes Early Eocene deposits related to Jahrum formation and clarifies the appearance and disappearing of *Opertorbitolites* Genus. The thickness of this biozone in Bador bahman stratigraphic section of Jahrum formation is 45m and corresponds to Wynd (1965)'s biozone 44. This biozone corresponds to sub-middle lithostratigraphic unite of Jahrum formation in Bador bahman surface stratigraphic section.

Biozone 3: *Nummulites-Alveolina* assemblage zone. This biozone in Jahrum formation has Middle Eocene age and thickness of 95m and corresponds to Wynd (1965)'s biozone 51. Its Faunistic content includes: *Discocyclina* sp., *Nummulites* cf. *aturiscus*, *Nummulites* cf.

guettardi, *Coskinolina* sp. and corresponds to middel-upper litho stratigraphic unite of Jahrom formation in Bador bahman surface stratigraphic section [8].

Biozone 4: *Nummulites fichteli*-*Nummulites vascus* assemblage zone

This biozone generally contains Ruppelian age and has 14m thickness. The above mentioned biozone can be known as corresponding to the biozone introduced by Larsen (2009). This biozone corresponds to lower litho stratigraphic unite of Asmari formation in Bador bahman surface stratigraphic section. Its Faunistic content includes: *Rotalia viennoti*, *Ditrupa* sp., *Pearhapydionina* delicate.

Biozone 5: *Archaias asmaricus*- *Archaias hensoni*- *Miogypsinoides complanatus* assemblage zone. This biozone generally contains Chatian age and has 14m thickness and its thickness in Bador bahman Asmari formation of stratigraphic section is 12 meter. 9 This biozone corresponds to lower lithostratigraphic unite of Asmari formation in Bador bahman surface stratigraphic section and can be known as corresponding to the biozone introduced by Larsen (2009). Its Faunistic content includes: *Archaias asmaricus*, *Archaias hensoni*, *Miogypsinoides complanatus*.

Biozone 6: *Peneroplis evolutus*-*Austroterillina howchini* Assemblage Zone

This accumulative zone was first introduced by Wynd (1965)'s and is considered to be Aquitanian in age. This biozone corresponds to middle litho stratigraphic unite of Asmari formation in Bsdor bahman surface stratigraphic section. The biozone's thickness in Bador bahman Asmari formation of stratigraphic section is 52 meter and has the fossilic characteristics of:

Peneroplis thomasi, *Archaias* sp., *Pyrgo* sp., *Achaias krikukensis*, *Valvulina* sp., *Spirolina cylindracea*, *Triloculina trigonula*.

Biozone 7: *Borelis melo* group-*Meandropsina iranica* Assemblage Zone

This accumulative zone is equivalent to the zone introduced by Adams and Bourgeois (1967) and indicates the Burdigalian time. This biozone corresponds to upper litho stratigraphic unite of Asmari formation in Bador bahman surface stratigraphic section. 10. The biozone's thickness in Bador bahman Asmari formation of stratigraphic section is 57 meter and has the fossilic characteristics of:

Dendritina rangi, *Valvulina* sp., *Pyrgo* sp., *Triloculina trigonula*, *Peneroplis thomasi*, *Austrotrillina* sp., *Borelis* sp., *Meandropsina anahensis*.

Regarding the microbio stratigraphy studies and presence of existing genera and species, biozone 1 (Jahrum formation) and biozone 4 (Asmari formation) in Kharman Mountain surface stratigraphic section were identified and studied (**Figure 5**).

Biozone 1: *Dictyoconus-Coskinolina-Orbitolites complanatus* Assemblage zone

It corresponds to Wynd (1965)'s biozone 50 and generally has Middle Eocene age. The thickness of this biozone is 5 mtere in Kharman Mountain stratigraphy surface section of Jahrum formation. Its fossilic content includes:

Somalina stefaninii, *Dictyoconus agyptiansis*, *Nummulites* sp., *Rhapydionina urensis*, *coskinolina liburnica*.

Biozone 2: *Nummulites fichteli-Nummulites vascus* Assemblage Zone

This biozone has Ruppelian age and corresponds to lower lithostratigraphic unite of Asmari formation in Kharman Mountain surface stratigraphic section. The thickness of the section under study is 20.5 meter. This biozone can be corresponded to the biozone introduced by Larsen (2009). Its Faunistic content includes: *Rotalia viennoti*, *Spiroclypeus ranjanae*, *Ditrupea* sp., *Pearhapydionina delicate*

Biozone 3: *Archaias asmaricus-Archaias hensoni-Miogypsinoides complanatus* assemblage zone

This biozone has generally Chatian age and includes lower lithostratigraphic unite of Asmari formation in Kharman Mountain surface stratigraphic section. The thickness of the section under study is 20 meter. This biozone can be corresponded to the biozone introduced by Larsen (2009). Its Faunistic content includes: *Archaias asmaricus*, *Archaias hensoni*, *Miogypsinoides complanatus*

Biozone 4:*Peneroplis evolutus-Austroterillina howchini* Assemblage Zone

This accumulative biozone was first introduced by Wynd (1965) and based on Thomas classification (1948) is equivalent to middle Asamri and corresponds to Aquitanian in age. This biozone corresponds to middle lithostratigraphic unite of Asmari formation in Kharman Mountain surface stratigraphic section. The thickness of the section under study is 20 meter. This biozone can be corresponded to the biozone introduced by Larsen (2009). Its fossilic content includes: *Peneroplis thomasi*, *Archaias* sp., *Pyrgo* sp., *Achais krikukensis*, *Valvulina* sp., *Spirolina cylindracea*, *Triloculina trigonula*.

Biozone 5 :*Borelis melo group-Meandropsina iranica* Assemblage Zone

This accumulative biozone is equivalent to the zone introduced by Adams and Bourgeois (1967) and indicates the Burdigalian time. This biozone corresponds to upper lithostratigraphic unite of Asmari formation in Kharman Mountain surface stratigraphic section. The biozone's thickness in Kharman Mountain stratigraphic section is 40 meter and has the fossilic characteristics of:

Dendritina rangi, *Valvulina* sp., *Pyrgo* sp., *Triloculina trigonula*, *Peneroplis thomasi*, *Austrotrillina* sp., *Borelis* sp., *Meandropsina anahensis*.

Regarding the microbiostratigraphy studies and presence of existing genera and species, biozone 4 (Jahrum formation) and biozone 2 (Asmari formation) in Abmorghan mountain surface stratigraphic section were identified and studied (**Figure 6**).

Biozone 1: *Miscellanea-Kathina* assemblage zone.

This biozone has generally Late Paleocene age related to Jahrum formation and corresponds to Wynd (1965)'s biozone 43. This biozone is corresponded to lower lithostratigraphic unite of Jahrum formation in Abmorghan mountain stratigraphy surface section. The thickness of this biozone is 52 meter. Its Faunistic content includes:

Fallotella alavensis, *Nummulites* sp., *Lockartia* sp., *Orbitolites shirazeinsis*

Biozone 2: *Opertorbitolites* Acro Zone

This biozone has EarlyEocene age sediments belonging to Jahrum formation and identifies the appearance and extinction of *Opertorbitolites* Genus. This biozone corresponds to middle lithostratigraphic unite of Jahrum formation in Abmorghan mountain surface stratigraphic section. The thickness of the section under study is 48 meter and corresponds to Wynd (1965)'s biozone 44.

Biozone 3: *Dictyoconus-Coskinolina-Orbitolites complanatus* Assemblage Zone

This biozone has Middle Eocene age sediments belonging to Jahrum formation. This biozone corresponds to upperside lithostratigraphic unite of Jahrum formation in Abmorghan mountain surface stratigraphic section. The thickness of the section under study is 48 meter and corresponds to Wynd (1965)'s biozone 51. Its fossilic content includes *Discocyclina* sp., *Nummulites* cf. *aturiscus*, *Nummulites* cf. *guettardi*, *Coskinolina* sp.

Biozone 4: *Somalina stefaninii* Subzone

This subzone has Middle Eocene age sediments belonging to Jahrum formation and is as thick as 32 meter. This subzone corresponds to upper lithostratigraphic unite of Jahrum formation in Abmorghan mountain surface stratigraphic section. The existence of *Somalina stefaninii* species shows the

appearance of this subzone that is located on accumulative Biozone 3.

Biozone 5: *Eulepidina-Nephrolepidina-Nummulites* assemblage zone

This biozone has generally Oligocene (Ruppelian-Chatian) age and is as thick as 76 meter. This biozone corresponds to lower-middle lithostratigraphic unite of Asmari formation in Abmorghan mountain surface stratigraphic section and can be considered to be equivalent to the zone introduced by Adams and Bourgeois (1967).

Biozone 6 :*Austrotrillina howchini-Peneroplis evolutus* assemblage zone

This biozone was first introduced by Wynd (1965) and corresponds to Aquitanian in age. This biozone corresponds to upper lithostratigraphic unite of Asmari formation in Abmorghan mountain surface stratigraphic section. The thickness of the section under study is 30 meters and its fossilic content includes:

Peneroplis thomasi, *Spirolina cylindracea*, *Archaias krikukensis*, *Triloculina trigonula*

According to fine microbiostratigraphy studies and the existence of genera and species was identified in 3 existent biozones (Jahrum formation) in stratigraphic surface section of Asef Mountain (**Figure 7**)

Biozone 1: *Opertorbitolites* Acro Zone

This biozone includes Early Eocene deposits related to Jahrum formation in surface stratigraphic section Asef Mountain, and defines the appearance and disappearance range of *Opertorbitolites* Genus. This biozone is considered corresponding to lower lithostratigraphic unite of Jahrum formation in surface stratigraphic section of Asef Mountain. The thickness of this biozone is 90m and corresponds to Wynd (1965)'s biozone 44 [14].

Biozone 2: *Dictyoconus-Coskinolina-Orbitolites complanatus* Assemblage Zone

This biozone includes Middle Eocene deposits related to Jahrum formation stratigraphic section of Asef Mountain. This biozone is considered corresponding to the middle lithostratigraphic unite of Jahrum formation in surface stratigraphic cut of Asef Mountain. The thickness of this biozone is 42m corresponding to Wynd (1965)'s biozone 51. Its fossilic content includes: *Discocyclina* sp., *Nummulites* cf. *aturiscus*, *Nummulites* cf. *guettardi*, *Coskinolina* sp.

Biozone 3: *Somalina stefaninii* Subzone

This subzone includes Middle Eocene deposits of Jahrum formation in surface stratigraphic section of Asef Mountain and the thickness of this biozone is 68m. This subzone is considered corresponding to the upper lithostratigraphic unite of Jahrum

formation in surface stratigraphic section of Asef Mountain. The presence of *Somalina stefaninii* species shows the initiation of this zone which is located on no. 2 accumulative zone.

According to fine microbio stratigraphy, the existence of genera and species existent in 2 biozones (Jahrum formation) and 3 biozones (Asmari formation) in subsurface section of Sarvestan Oil Well was identified.

Biozone 1: *Dictyoconus- Coskinolina- Orbitolites complanatus* assemblage subzone

This biozone generally has Middle Eocene age. It is considered corresponding to lower lithostratigraphic unite of Jahrum formation in subsurface stratigraphic section of Sarvestan Oil Well. Its thickness in Jahrum formation in the studied subsurface cut is 263m. Its Faunistic content includes:

Miliolids, Radiolaria, Nummulites spp., *Peneroplis dusehbury, Dictyoconus, Coskinolina, Orbitolites complanatus,* Echinoid fragments, Algae, Bryozoans

Biozone 2: *Nummulites fabiani- Chapmanina* assemblage zone

This biozone includes Upper Eocene deposits related to Jahrum formation in subsurface stratigraphic section of Sarvestan Oil Well [15]. It is considered corresponding to upper and middle litho stratigraphic unite of Jahrum formation in subsurface stratigraphic section

of Sarvestan Oil Well. The thickness of this biozone is 83m. Its Faunistic content includes: *Fabiania cubensis. Nummulites fabiani, Elphidium* spp., *Rotalia trochidiformis, Bigenerina* sp., *Nummulites* spp., *Rotalia* spp., *Discocyclina* sp., Corals

Biozone 3: *Nummulites intermedius-N.vascus* assemblage subzone

This biozone generally has Oligocene (Ruppelian) age. It is considered corresponding to lower lithostratigraphic unite of Asmari formation in subsurface stratigraphic section of Sarvestan Oil Well. Its thickness in Asmari formation's subsurface stratigraphic section of Sarvestan Oil Well is 58m. Its Faunistic content includes:

Reusella spp., *Miliolids, Ammonia beccarii, Globigerina* spp., *Operculina complanata, Nummulites intermedius, Peneroplis thomasi, Praerhapydionina delicata, Nummulites* spp., *Archaias operculiniformis, Dendritina rangi, Bigenerina* sp., *Pyrgo* sp., *Gypsina* sp., *Peneroplis thomasi, Valvulina* sp., *Tubucellaria* sp., *Peneroplis evolutus, Elphidium* sp., *Disscorbis* spp., *Spirolina cylindracea, Operculina complanatus, Meandropsina anahensis*

Biozone 4: *Archaias operculiniformis* Zone

This biozone generally has Oligocene (Chatian) age. It is considered corresponding to middle lithostratigraphic unite of Asmari

formation in subsurface stratigraphic section of Sarvestan Oil Well. Its thickness in Asmari formation's subsurface stratigraphic section of Sarvestan Oil Well is 70m. Its Faunistic content includes:

Reusella spp., *Ammonia beccarii*, *Globigerina* spp., *Rotalia vlnnoti*, *Operculina complanata*, *Nummulites intermedius*, *Peneroplis thomasi*, *Praerhapydionina delicata*, *Nummulites* spp., *Austrotrillina paucialveolata*, *Archaias operculiniformis*, *Dendritina rangi*, *Bigenerina* sp., *Pyrgo* sp., *Gypsina* sp., *Peneroplis glynjonesi*, *Planorbulina* spp., *Valvulina* sp., *Tubucellaria* sp., *Asterigerina rotula*, *Peneroplis evolutus*, *Austrotrillina howchini*, *Elphidium* sp.

Biozone 5: *Austrotrillina howchini*-*Peneroplis evolutus* assemblage zone

This biozone includes Early Miocene deposits (Aquitaniens) related to Asmari formation's subsurface stratigraphic section of Sarvestan Oil Well. This biozone is considered

corresponding to the upper lithostratigraphic unit of Asmari formation in subsurface stratigraphic section of Sarvestan Oil Well. The thickness of this biozone is 67m. Its Faunistic content includes:

Reusella spp., *Miliolid* spp., *Ammonia beccarii*, *Globigerina* spp., *Rotalia vlnnoti*, *Operculina complanata*, *Nummulites intermedius*, *Peneroplis thomasi*, *Praerhapydionina delicata*, *Nummulites* spp., *Austrotrillina paucialveolata*, *Archaias operculiniformis*, *Dendritina rangi*, *Bigenerina* sp., *Pyrgo* sp., *Gypsina* sp., *Peneroplis glynjonesi*, *Planorbulina* spp., *Valvulina* sp., *Tubucellaria* sp., *Asterigerina rotula*, *Peneroplis evolutus*, *Austrotrillina howchini*, *Elphidium* sp., *Dissorbis* spp., *Spirolina cylindracea*, *Orbitolites complanatus*, *Radiolaria*, *Ammonia* spp., *Elphidium* spp., *Peneroplis* sp., *Lepidocyclina* sp.

No	Section Name	Formation	Dominant Lithology	Coordinate U.T.M	Lower Limit	Thickness (Jahrum)	Thickness (Asmari)	Upper Limit
1	Bador bahman	Jahrum,Asmari, Razak	Limestone,Dolomitic limestone,Siltstone	53°52'00"E 29°10'00"N	Jahrum	190	135	Razak
2	Ab morghan Mountain	Sachun,Jahrum ,Asmari,Razak	Limestone,Dolomitic limestone,Limestone	52°37'00"E 29°38'00"N	Sachun	180	106	Razak
3	Asef Mountain	Sachun,Jahrum, Asmari	Limestone,Dolomitic limestone,Limestone	52°30'00"E 29°50'00"N	Sachun	200	10	Asmari
4	Kharman Mountain	Jahrum,Asmari, Razak	Limestone,Siltstone	52°10'00"E 29°17'00"N	Jahrum	5	150	Razak
5	Oil wellsarves tan	Sachun, Jahrum, Asmari,Razak	Shale,Dolomitic,Dolomitic limestone, Limestone,Siltstone	52°10'00"E 29°11'00"N	Sachun	346	195	Razak

Figure 1: Geographical coordinate and Lithostratigraphy state of the studied surface and subsurface stratigraphic sections

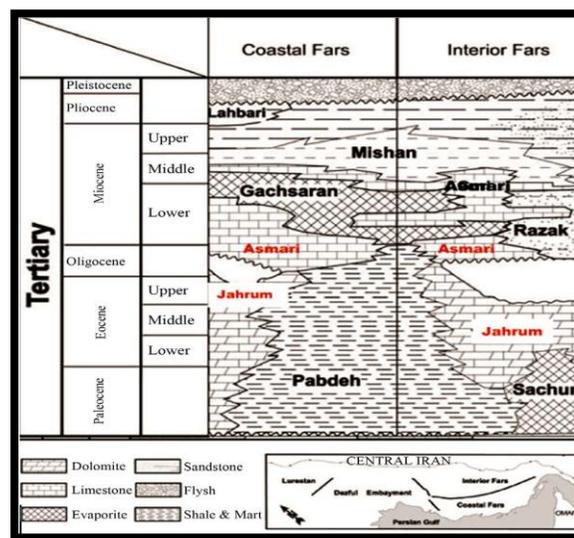


Figure 2: Relation of Lithostratigraphy of studied formations in Fars region [5]

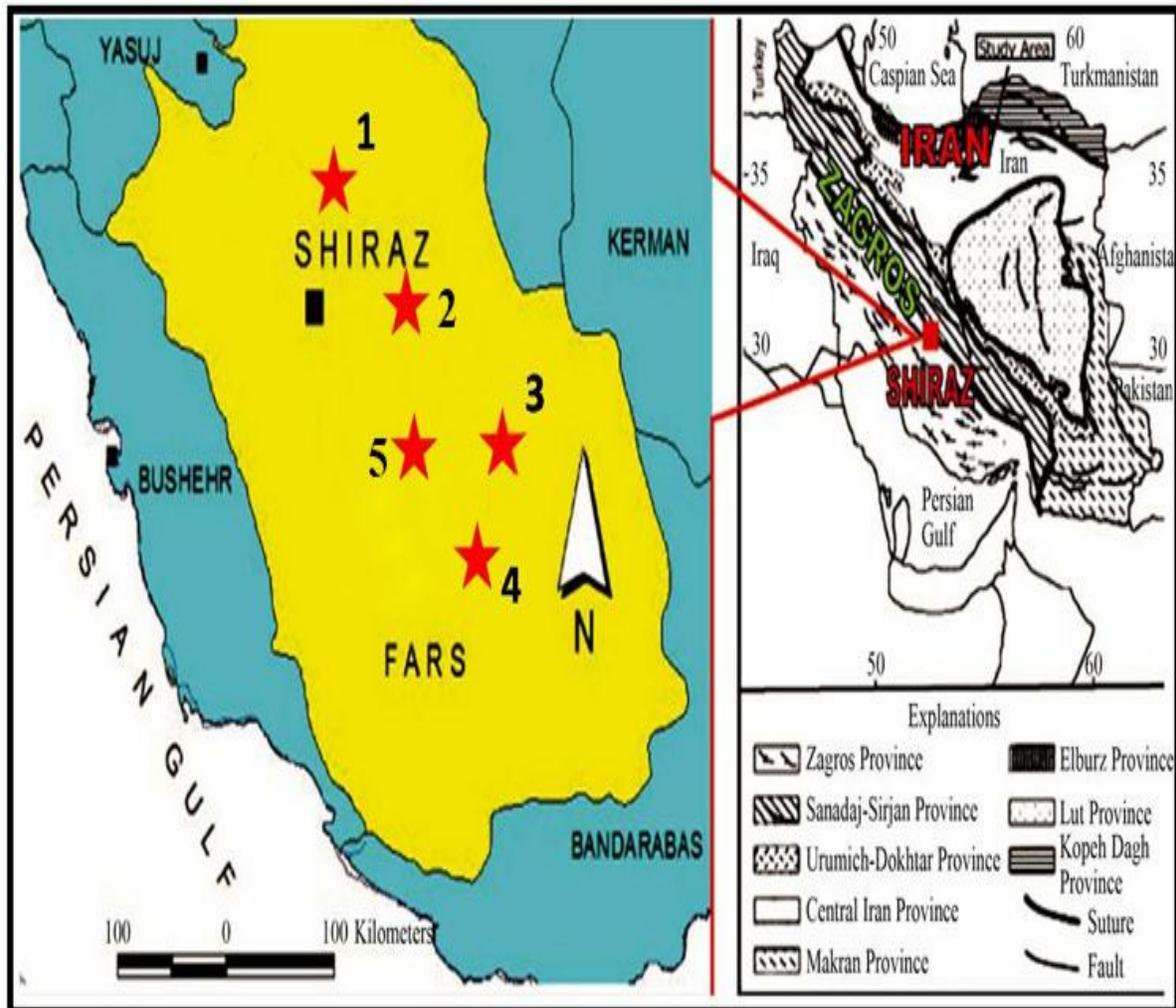


Figure 3: Geographical situation of studied stratigraphic sections (1 Asef Mountain surface section stratigraphy, 2 Ab morghanmountain surface section stratigraphy, 3 Bador Bahman surface section stratigraphy, 4 Kharman Mountain surface section stratigraphy, 5 Sarvestan oil well surface section stratigraphy) [6]

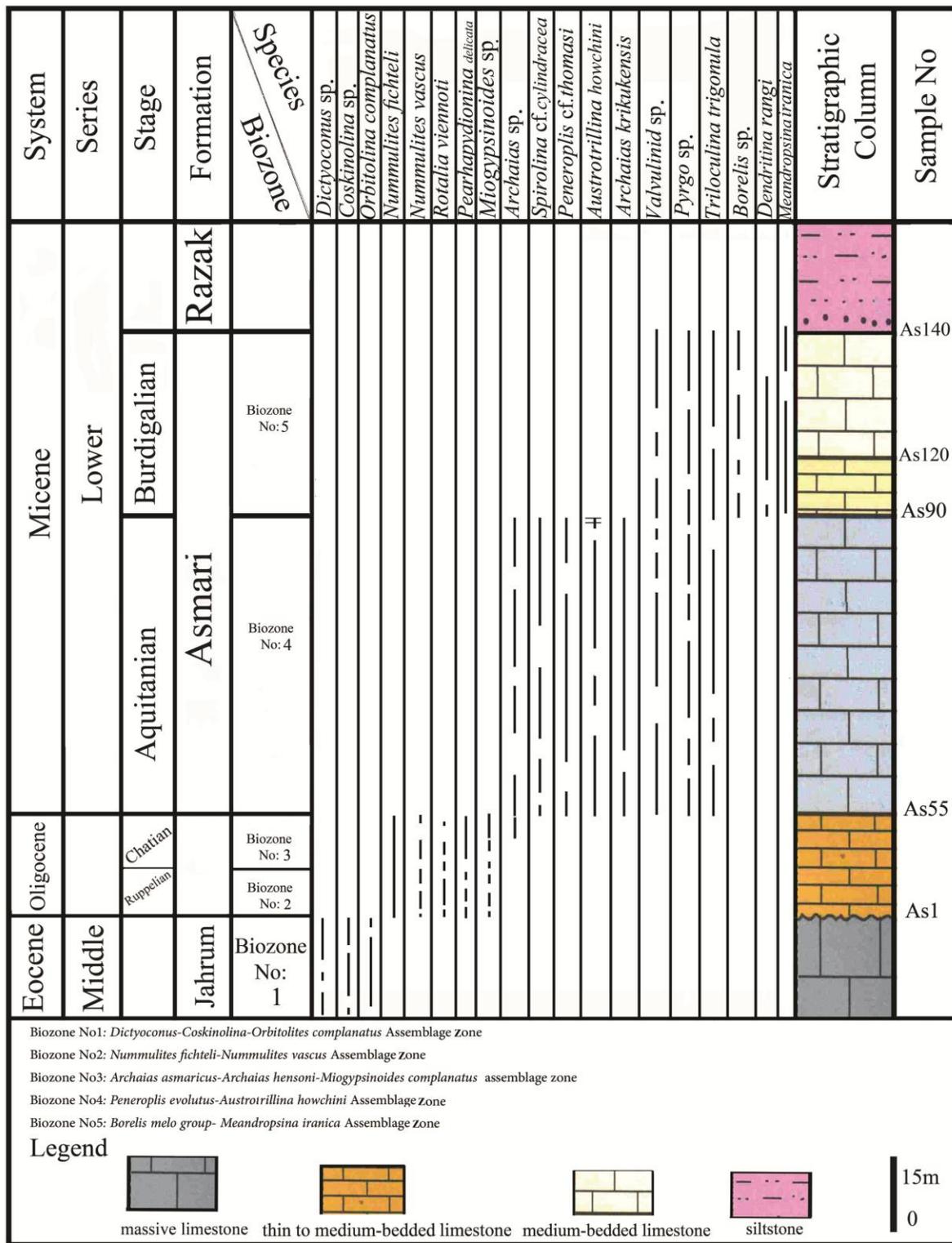


Figure 5: The column of microbiostratigraphy of Jahrum and Asmari formations in surface stratigraphic section of Kahrman mountain

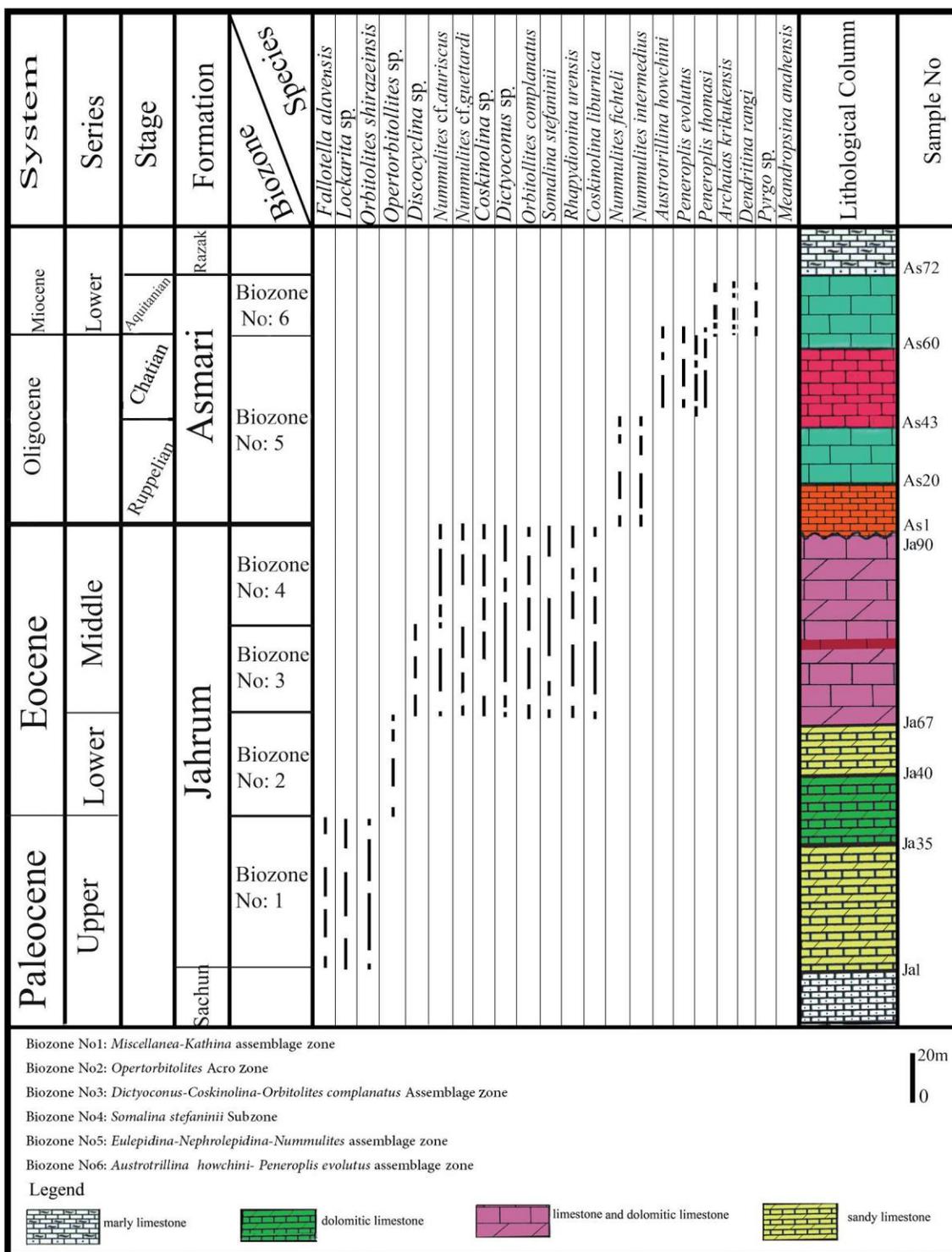


Figure 6: The column of microbiostratigraphy of Jahrum and Asmari formations in Abmorghan Mountain surface stratigraphic section

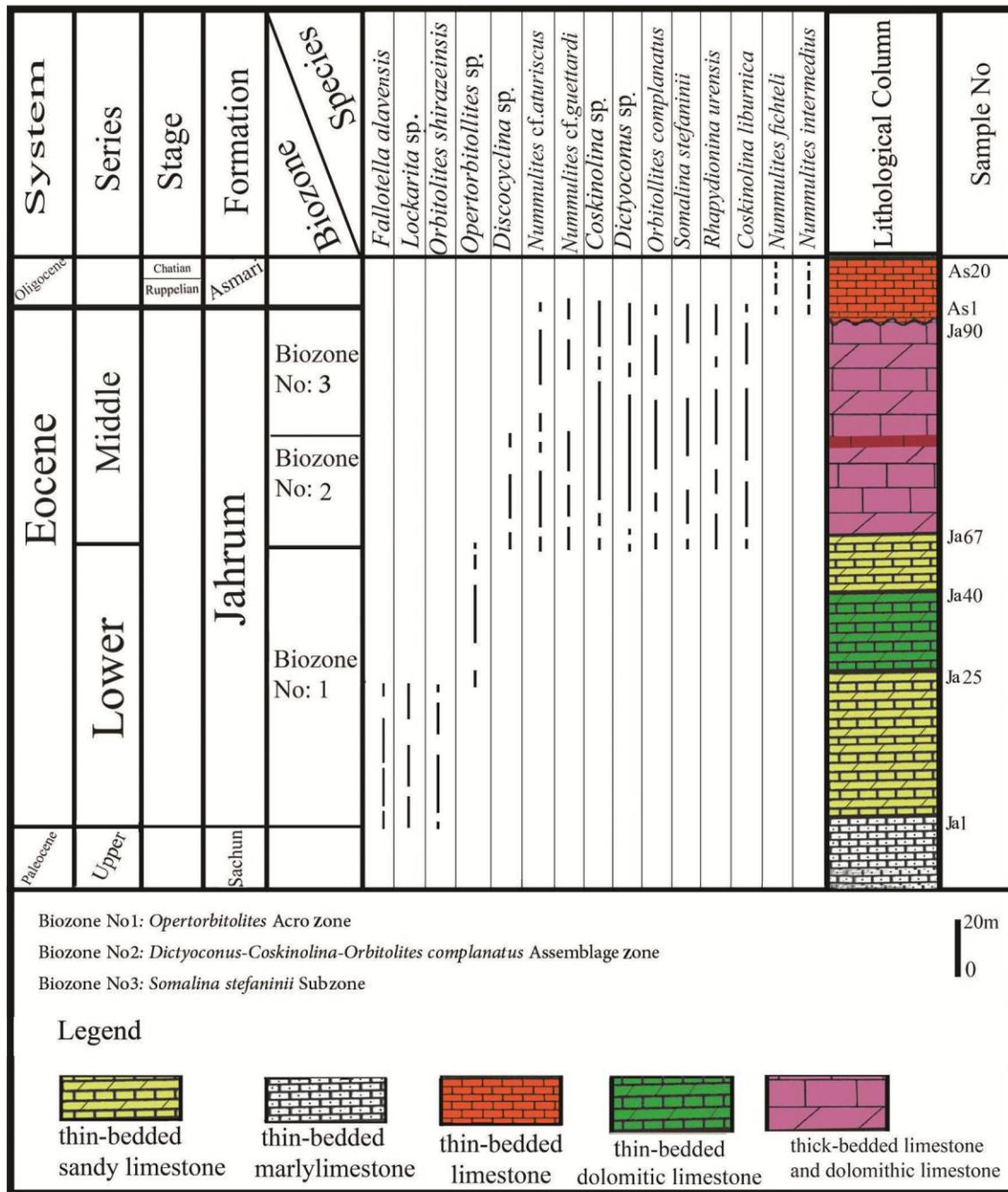


Figure 7: Microbiostratigraphy column of Asmari and Jahrum formations in surface stratigraphic section of Asef Mountain

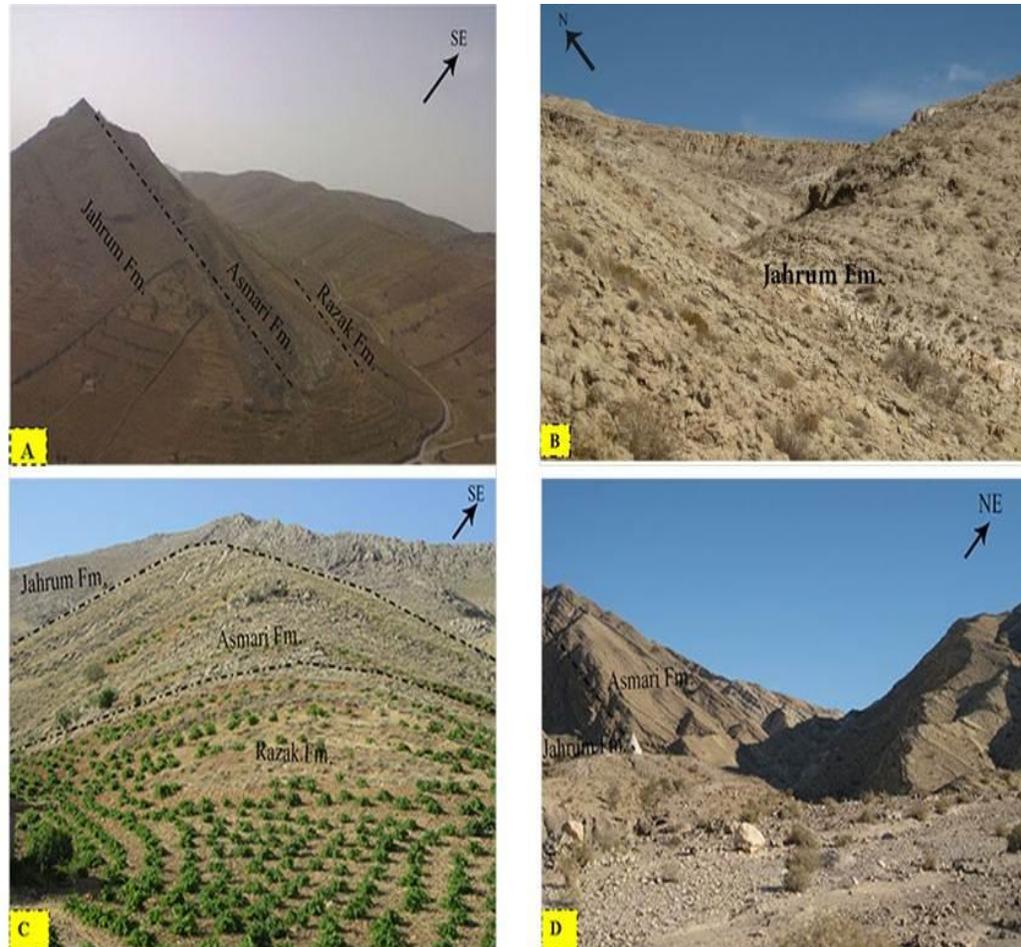


Figure 8. (A) Border of Jahrum-Asmari formations in Bador Bahman surface stratigraphic section, (B) Border of Jahrum-Asmari formations in Asef Mountain surface stratigraphic section, (C) Border of Jahrum-Asmari formations in Ab Morghan surface stratigraphic section, (D) Border of Jahrum-Asmari formations in Kharman Mountain surface stratigraphic section.

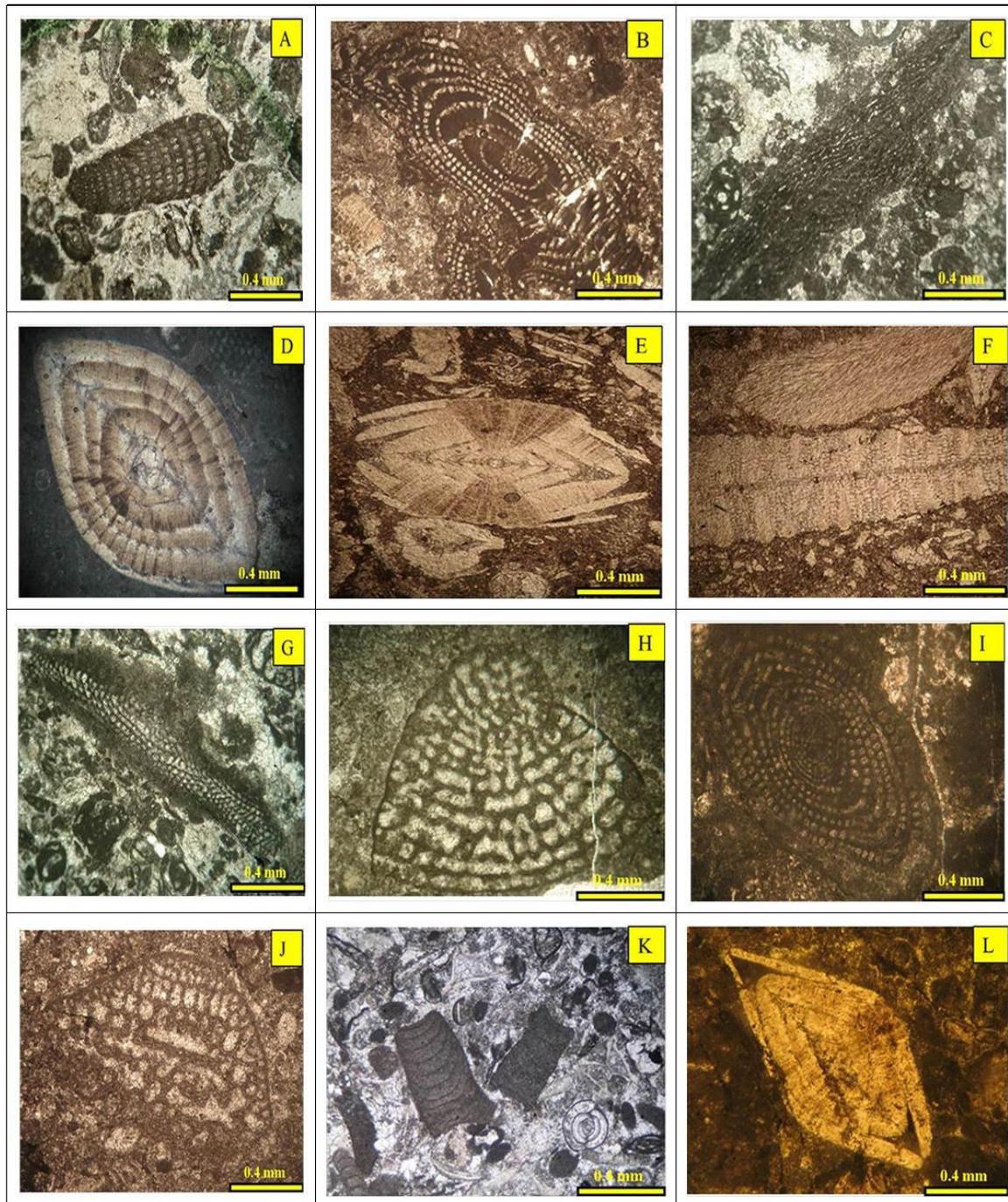


Figure 9: Some typical microfossils existent in Jahrum formation in studied surface and subsurface stratigraphic sections

(A) *Rhaphydionina urensis*, (B) *Alveolinacylindrata*, (C) *Somalina* sp., (D) *Nummulites* sp., (E) *Nummulites globulus*, (F) *Discocyclina* sp., (G) *Opertorbitolites complanatus*, (H) *Coskinolina* cf. *liburnica*, (I) *Alveolina munieri*, (J) *Coskinolina* sp., (K) *Lithophylum* sp., (L) *Nummulites* sp.

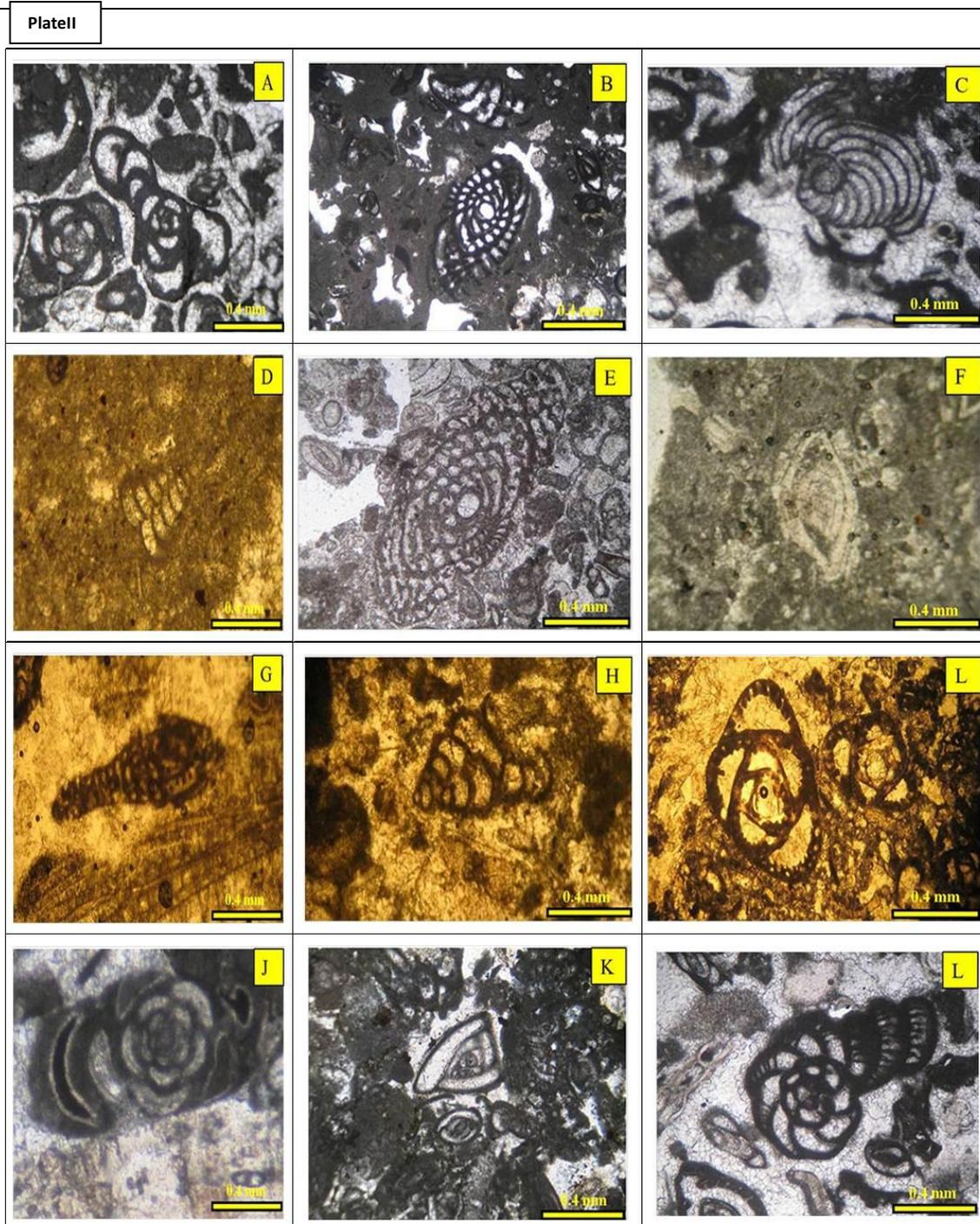


Figure 10: Some typical microfossils existent in Asmari formation in studied surface and subsurface stratigraphic cuts

(A) *Dendritina rangi* (B) *Archaias kirkukensis* (C) *Peneroplis evolutus* (D) *Reussella* sp. (E) *Archaias operculiniformis* (F) *Amphistegina* sp. (G) *Archaias asmaricus* (H) *Valvulinid* sp. (I) *Austrotrillina howchini* (J) *Quincueloculina* sp. (K) *Triloculina tricarinata* (L) *Spirolina* sp.

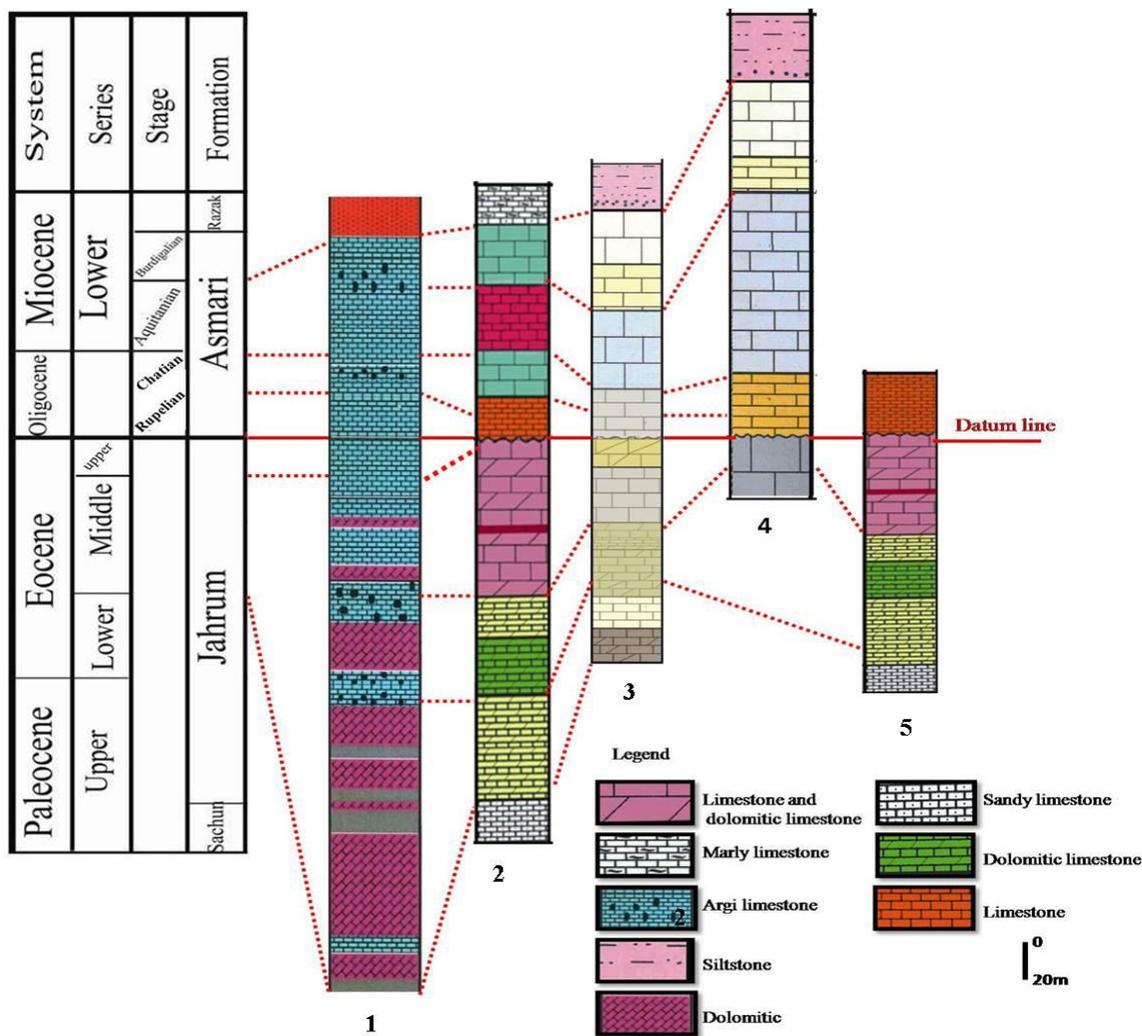


Figure 11: The Status of Jahrum and Asmari formations border in studied surface and subsurface stratigraphic section (1:subsurface stratigraphic section of Sarvestan Oil Well, 2: surface stratigraphic section of Abmorghan Mountain, 3: surface stratigraphic section of Bador Bahman, 4: surface stratigraphic section of Kharman Mountain, 5: surface stratigraphic section of Asef Mountain)

CONCLUSION

The deposits of Jahrum formation with thickness of 921m and the deposits of Asmari formation with thickness of 596m was sampled and studied with lithology of limestone, Dolomitic limestone, Dolomitic and Marli mid-layers in surface and subsurface stratigraphic sections in order to determine the age of and represent

biozonation for these formations. The status of Eocene – Oligocene border in most studied surface and subsurface stratigraphic sections is in a corrosive inconsistent way, which can be considered equal to Pyrenean orogenic phase performance. The nonexistence of typical LateEocene microfossils in most studied cuts and the existence of iron oxide and microconglomerate region in Jahrum and

Asmari formations' border in studied regions indicates the above mentioned discontinuity. The Datum line of Early Oligocene (Ruppelian) was considered (**Figure 11**). Regarding the typical microfossils, the age of Jahrum Last Paleocene to Late Eocene and that of Asmari formation of Ruppelian to Burdigalian were determined.

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