

Biostratigraphy of Middle Eocene deposits on the base of benthic foraminifera in Shurab, Qom, Central Iran

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Abstract

In order to biostratigraphy and determine the age of Eocene deposits, a stratigraphic section was studied in Shurab area. The area is located in 40 km SE. of Qom city, in Central Iran. Eocene deposits could be divided in to 6 informal rock-unites in this region including E₁ to E₆. Lithological characteristics and stratigraphic position of the examined rocks indicate that the oldest part of the section is equivalent to E₄ member which predominantly consists of volcanic rocks. E₅ unit includes various sequences of carbonate, terrigenous and pyroclastic sediments. E₆ unit is composed of conglomerate and sandstone. The thickness of this stratigraphy section is 406 m and 90 samples were collected. Eocene succession in the studied area reveals a coincidence of volcanic activities and sedimentation in a shallow marine basin having influenced the diversity of fauna. According to diversity of benthic foraminifera in the area investigated, 12 genera and 7 species were identified. Based on chronostratigraphic value of the identified taxa, the Late Lutetian- Bartonian age was ascribed to the Eocene deposits in Shourab section.

Introduction

Shurab village lies about 40 Km south east of Qom in central Iran. The oldest Tertiary sediments in this region are related to the Eocene. Based on previous studies (Hajian 1970 & Emami 1991) Eocene deposits have been divided in to 6 informal rock units in this region (E₁-E₆). E₁ member consists of red, terrigenous rocks. These sediments have been assigned to Early Eocene on the base of stratigraphic position. E₂ unit which is called lower volcanic member basically includes volcanic rocks. An age of Early Lutetian could be ascribed using two nummulitic horizons at top and base of the unit.

E₃ member (Lutetian in age) which is called lower green series dominantly consists of green tuff and nummulitic limestone. E₄ member or middle red unit mainly composes of volcanic and pyroclastic rocks. Presence of a nummulitic bed on top of E₄ indicates the Late Lutetian age for this member. E₅ rock unit, (so-called as upper green series) consists of green tuff, tuffite and nummulitic limestones with an age of the Lutetian-Bartonian. E₆ member dominantly composed of volcanic rocks, conglomerate, sandstone and pyroclastics partly interbedded with marl, is considered to be Late Eocene.

Lithological characteristics and stratigraphic position of the studied deposits reveals that, the oldest outcrop in study section is equivalent to E₄ member. This member is overlain by sedimentary and pyroclastic rocks of E₅ series. E₆ member in Shurab area consists of conglomerate alternated with medium to thick bedded sandstones.

Stratigraphy

In order to biostratigraphic studies on the Eocene deposits in Shurab area, a complete section was measured and sampled in detail. The investigated area located at 51° 08' 15" to 51° 09' 50" E longitude and 34° 20' 10" to 34° 22' 15" N latitude (Fig.1)

From lithostratigraphic point of view E₄ member is the oldest rock unit which is exposed in Shurab area. At this locality, this member comprises of dark green to grey porphyritic andesite. The member is disconformably overlain by 42 meters grey conglomerate of the base of E₅ member which gradually changes to calcareous sandstone to sandy limestone. Upsection, the sedimentary sequence is followed by 85m brown to cream thick bedded limestone interbedded with green thin bedded limestone. Benthic foraminifera have a conspicuous variety in this interval. After that, the succession is followed by 2m calcareous sandstone, and 7m conglomerate that are followed by 19.5m green tuff and 21m conglomerate. The conglomerate beds are topped by 30m brown, medium to thick bedded limestone enriched by benthic foraminifera. The upper most part of the E₅ member includes 65m of green medium bedded tuffaceous limestone, tuff and tuffite. E₆ member with a thickness of 128m includes alternation of brown to red thick bedded conglomerate and sandstones, disconformably resting on E₅ rock unit. After a covered zone, red and green, silty shale with intercalations of sandstones belonging to Lower Red Formation with an Oligocene age unconformably overlies E₆ member (fig 2).

Biostratigraphy of the Eocene deposits

In this study a total of 90 samples from the 406m thick sequence were collected in Shurab section. Only the middle part of E₅ member of the Eocene deposits is characterized by presence of larger benthic foraminifera. Based on micropaleontological studies 12 genera and 7 species were identified. On the basis of diversity, appearance and disappearance of various taxa, four biozones and one barren interzone were suggested that including:

1- *Rotalia trochidiformis*, *Fabiania* sp. Interval zone

This biozone includes lower carbonate part of the E₅ member and with a thickness of 85m. Base of the zone is marked by appearance of *Rotalia trochidiformis* and top by the first occurrence of *Fabiania*. The identified benthic foraminifera indicate the Late Lutetian-Bartonian age for this interval.

2- *Nummulites aturicus*, *Nummulites globulus* Assemblage Zone

This assemblage zone occurs just above *Rotalia trochidiformis*, *Fabiania* sp. interval zone and includes a thickness of 24m of E₅ member. This biozone is characterized by the presence of *Nummulites aturicus* and *Nummulites globulus*. The foraminiferal association is also accompanied by *Asterigerina* sp., *Eorupertia* sp., *Orbitolites* sp., *Nummulites* sp., *Fabiania* sp. and *Rotalia trochidiformis*. Based on chronostratigraphic value of the identified taxa the Late Lutetian-Bartonian age is suggested for this part of E₅ member.

3- *Assilina granolosa* Taxon Range Zone

This biozone immediately begins above *Nummulites aturicus*, *Nummulites globulus* assemblage zone and includes a thickness of 26m of the E₅ member. This zone is recognized by the total occurrence of *Assilina granolosa*. based on the identified taxon the Late Lutetian-Bartonian age is suggested for this interval of E₅ member.

3- Barren interzone

This barren zone begins above *Assilina granolosa* taxon range zone and includes 79m of E₅ member. Lithologically, this interval consists of green tuff, tuffaceous limestones and conglomerate.

4- *Discocyclina nummulitica* Taxon Range Zone

This taxon range zone include 31m of the upper part of E₅ member and it is marked by the total appearance of *Discocyclina nummulitica*. Based on the identified taxon, the Late Lutetian-Bartonian age is suggested for this interval of E₅ member.

According to chronostratigraphic value of the identified taxa, the Late Lutetian- Bartonian age was ascribed to the Eocene deposits in Shourab section.

Conclusions

Based on lithostratigraphic characteristics, the oldest rocks of Eocene outcrops in Shurab area are equivalent to the E₄ member. Eocene deposits in this region include various sequences of carbonate, terrigenous, pyroclastic and igneous rocks. Three lithological members (E₄, E₅ & E₆) can be distinguished in Eocene rocks in Shurab area. The study succession reveals a coincidence of volcanic activities and sedimentation in a shallow marine basin having influenced the diversity of fauna. Twelve genera and 7 species were identified in this study. On the basis of diversity, appearance and disappearance of various benthic foraminiferal taxa, four biozones and one barren interzone were identified and introduced. Based on chronostratigraphic value of the identified taxa, the Late Lutetian- Bartonian age was ascribed to the Eocene deposits in Shourab section.

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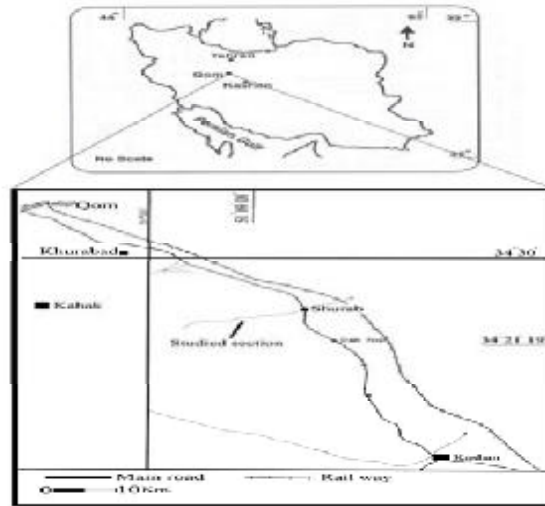


Fig.1. Location map of the studied area, SE. of Qom, in central Iran.

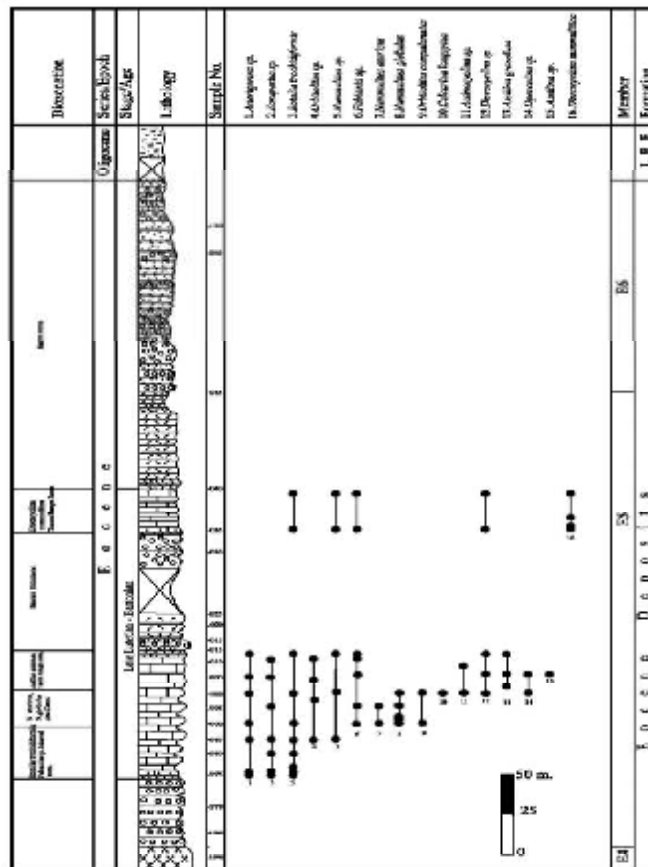


Fig.2. Stratigraphic section and distribution of foraminifera at Shurab section.

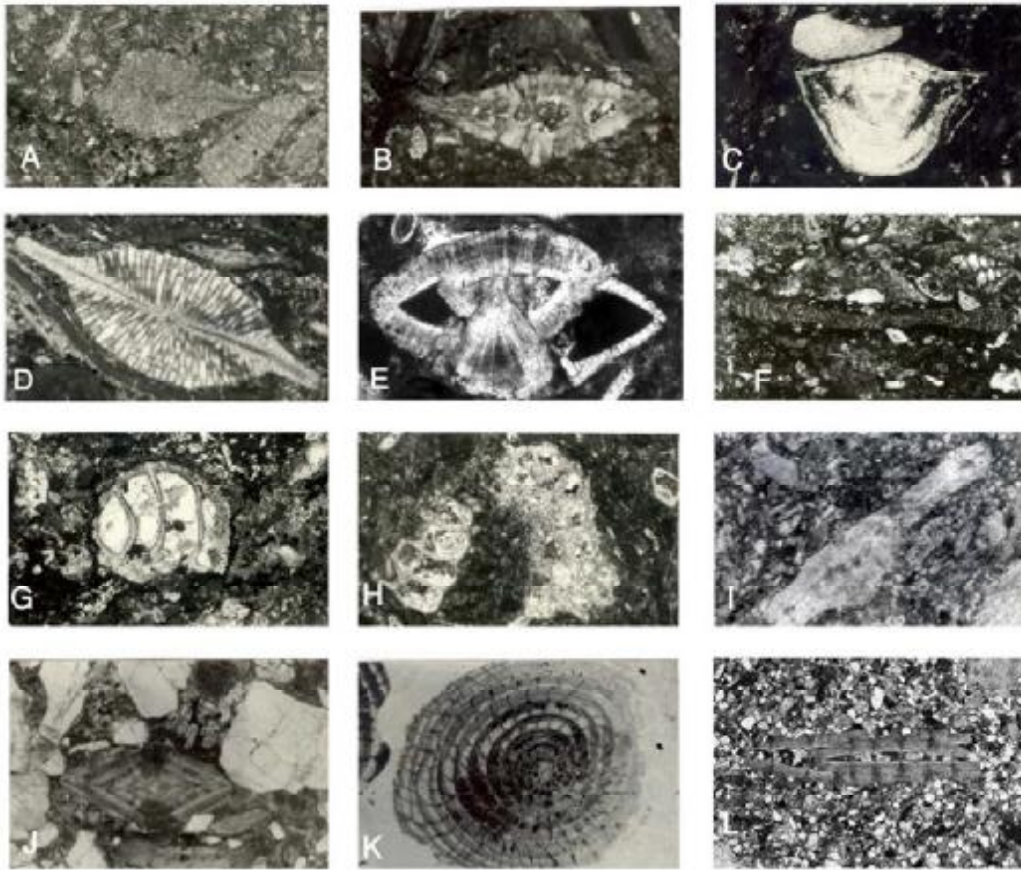


Fig.A:*Discocyclus marthae*X.37, Fig.B:*Calcarina longispina* X.27, Fig.C: *Asterigerina* sp.X.30
Fig.D:*Discocyclus nummulitica* X.30, Fig.E: *Rotalia trichiformis* X.40, Fig.F:*Orbitolites compalanatus* X.19, Fig.G: *Eorupertia* sp.X.15 ,Fig.H: *Fabiania* sp.X.18, Fig.I: *Operculina* sp.X.20,
Fig.J:*Nummulites globulus* X.20, Fig.K:*Nummulites aturicus* X.5, Fig L:*Assilina granulosa* X18.