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Introduction to calcareous algae in Esfiyukh Mountain

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ABSTRACT

In this research the biostratigraphy in Esfiyukh Mountain (5 km of North-east of Torbat-e-Heydarieh) is studied for the first time. The deposits in this section are about 175 meters thickness; lithology consists of alternative layers of medium bedded to very thick bedded limestone. This part overlies on brown-dark red sandstone & Jurassic deposits with angular unconformity and is overlain by late Cretaceous sediments with unconformable contact. The first study of benthic foraminifera and calcareous algae identification is the survey of paleoecology condition of benthic foraminifera, that 60 thin sections were studied. In this study ten genera and species of calcareous algae Salpingoporella cf. parapiriniae (Carras et al., 2006), Cylindroporella sp. (Elliot, 1979), Rajkella sp. (Dragastan & Bucur, 1993), Neomeris cretaceous (Stewmann, 1978), Triploporella sp. (SRIVASTAVA, 1978), (BUCUR, 1993), (Granier et al., 2000), Terquemella sp. (Radoicic, 1978), Boueina sp., Macroporella sp., Falsolikanella danilovae, (Radiocic ex1982), (Berger,1992)ag., Actinoporellageredeensis, (CONRAD,1970), Salpingoporella aff. hasi, ,(Carras et al, 2006) has been known. With view to association of benthic foraminifera the age of the studied section Barremian t-Aptian is determined.

1. Introduction

Torbat region between the Loot block and the south and north of the Alborz sedimentary basin is located in the central Iranian block sub- continent and is in the central part of Razavi Khorasan province. Cretaceous sediments in this area consist chiefly of fossiliferous limestone Lithology (orbito- Lin) which is gray and brown with some sections of foraminifera and calcareous algae. The formation of dolomite deposits in the stratigraphic column is also observed. The Orbitolin limestone is an informal title common in middle and east of Iran which mainly have a larger widespread (Kalantari, 1986). These Barremian to Aptian age limestone are generally in the transition areas which are on an older Jurassic basal conglomerate unconformity. The under study section is in the mountains of North East Esfiyukh of Torbat city located 5 kilometers NE shown in the Figure 1. The main objectives of this research are to study benthic foraminifera and calcareous algae and assess the situation the age of ancient life in the study area (Tucker, 2004).

A pile of gray limestone contains microfossil orbitolina (5/21 m).

B: gray and brown fossiliferous limestone containing abundant rudist (5/1 meter).

C: a mass of gray limestone contains microfossil orbitolina (71 meters).

D: dolomite (5/0 mm).

E. thick limestone layer containing a light gray and brown algae and calcareous microfossil orbitolina (80 meters). Figure 4

2. Materials and methods

A) Data Collection: To study the cutting sediments studied, respectively parts are followed; the information collected during phase of data collection, and a pilot study was conducted on previous studies on Cretaceous sediments of central Iran.

B) Field studies: This phase includes a preliminary investigation to determine the location of the stratigraphic sections and appropriate surveying and sampling of selected cuttings. Finally, the choice of the samples was done and 50 samples were prepared by manual cuttings. Simultaneous sampling, field specification, including physical samples, including color, grain size, layer thickness and sedimentary structures numbered samples were then investigated. Also the number of cuttings was noted next on units, to be available for future.

C) Experimental studies: The samples were transported to the laboratory for preparation. Rock samples were taken from at least one point and more was taken for samples with more fossils in two perpendicular thin sections were prepared. Finally, thin sections obtained by ordinary light microscope binocular form two viewpoints which were carefully studied and followed by paleontologist and petro graphic methods. Folk and Dunham tests were conducted.

D) Approval of samples was diagnosed by professors.

3. Results and discussion

Calcareous algae are abundant in marine sediments. Different ecological factors such as physical, chemical & biological control the distribution of algae (Wilson, 1975). Limestone algae in Iran are studied less than other fossil groups such as foraminifera, mollusks and etc. Considering that the Cretaceous sediments especially early Cretaceous in Iran is rich, their abundance variation study in Epoch will lead to a closer examination of micro stratigraphic.

Algae identified in this section include Actinoporella geredeensis Falsolikanella danilovae Rajkella sp. Macroporella neomeris cretaceous Salpingoporella parapiriniae Cylindroporella sp, which are from lime green Kladas A. Lithocodium aggregatum Kladas A species probably belongs to a Kudiase A and is a problematic fossil (Flugel, 2001). Some lime algae and calcareous benthic foraminifera are characterized by:

3.1. Lithocodium aggregatum

These algae reported here for the first time by Elliott (1956) from Iraq Hoterion deposits and are classified as algae Kudiase. Thereafter Riding (1991), identified that as a Gender attributed to calcareous cyan bacteria. Schmid & Leinfelder (1996, 1995) stated that Lithocodium aggregatum grows like foraminifera Troglotella incrustans, Lofssoiid which is namely the gender of a foraminifera root, and is a partner with the parasite tissue algal and in other words is a problematic discussed micro fossil. Lithocodium as inventory trap launcher, which is sticky and makes sedimentary structures (Husinec & Sokac, 2006).

3.2. Cylindroporella sp.

This genus is of Cretaceous (Barremian - Aptian) age. Then it is with the talus articulated algae which is circular at the end. Each part is related to a central stem and ends to a six branches and is alternatively containing the spore sac. There are short secondary branches (Tucker, 2004).

3.3. Neomeris cretaceous

This Cretaceous genus of algae is still present in the seas? It has a central stem and is spitted to primary branches and each string itself leads to a thin string s and calcite layers around the stem and branches are observed. Around the spore, the sac becomes thicker. The spores are spherical or pear-shaped sac on the first branch (Wilson, 1975).

Foraminifera identified in this section can be named as Mesorbitolina lotzei, Palorbitolina lenticularis, Charentia cuvillieri, Everticyclammina hedbergi, Pseudochoffatella sp. and Precautionsly gargazyan _ of Late Barremian upper middle Aptian age.

3.4. Ordo dasycladales(pascher,1931)

Currently, the nomenclature and assignments of fossil Dasycladales with a rank higher than genus necessilates an ad hoo revision. The following tentative hierarchy is provisional.

Familia Dasycladaceae (Kutzing, 1843) (Berger & KAEVER, 1992)(Tribus Dasycladaceae PIA, 1920) (Genus Falsolikanella Granier,1987) (Falsolikanella danilovae, Radoicic ex Baratallo, 1978) (Granier et al., 2000) (pl.1, figC; fig. 2)

Falsolikanella is present in the Dasycladalean association as subspherical or thick-discoidal corpuscles with rounded borders ("segments" or "rings" of the moniliform-type thallus; see RADOICIC 1968). Externally the laterals distal termination can be noticed. A short comment on the generic assignment of this alga (Likanella, Selliporella, Falsolikanella) is given by BUCUR (2000). Dimensions D=0.8-1.9mm.D=0.25-0.7 mm. L=0.35-0.60 mm.P(distal)=0.12-0.25 mm.

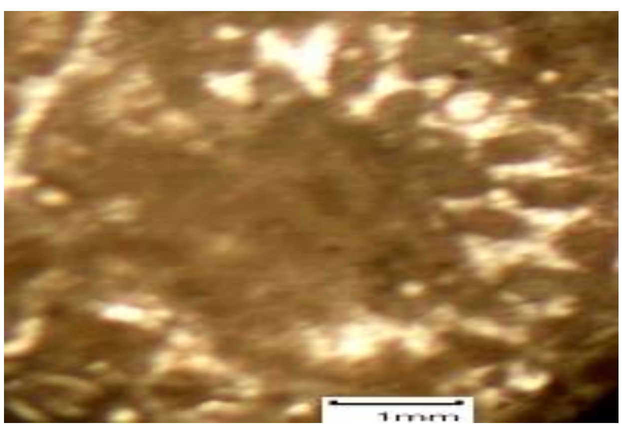

Fig. 1. Transversal section of Falsolikanella danilovae (Dasycladalean algae from the Esfiyukh Mountain), (Granier et al., 2000), sample 105b, scale bar 0.7mm.

3.5. Familia triploporellaceae (PIA, 1920) (BERGER & KAEVER, 1992), (Sensu Barattolo et al., 2008)

Quoting BERGER and KAEVER (1992,)"this family is characterized by euspondylarrangement of laterals and cladospore formation of gametangia".According to BARATTOLO et alii (2008) "Although the kind of reproduction (endosporous or cladosporous) is a high taxonomic character, their evidence is lacking in most of fossil taxa (…) the occurrence of thin and delicate laterals, irrespectively of whether trichophorous or pholoiophorous, is considered a proof of an endosporous reproduction (for a discussion see DE CASTRO, 1997). (…) consequently, the diagnosis of Triploporellaceae ought to include both endosporous and cladosporous reproduction."

Tribus Triploporelleae (PIA, 1920) (BASSOULLET et al., 1979)

3.6. Genus rajkaelia (Daragastan & Bucur, 1988)

The latest, emended diagnosis was introduced by Daragastan & Bucur, (1993), under the name Radoiciciella. Excerpts of the description are as follow: "(…) slightly calcified whorls spaced out along an unclassified (or extremely poorly calcified) axial cavity. Whorls made up of primary and secondary branches. Primaries, long and cylindrical (tubular), sometimes slightly dilated distally; they are perpendicular or more or less inclined to the axial cavity. Secondary, shorter and widening distally; they occur as ambush around the distal end of primaries. Sometimes the branches may be coalescent either proximally or on a longer part of their tract (…). Due to the poor calcification of the axial cavity, the alga is fragile and may be found only as fragments representing branches or part of them."So far, there are six valid species of Rajkaella, ranging in age from Tithonian to Aptian.

3.7. Rajkaella sp.

A provisional description is based on the one specimen (illustrated) available: narrow main axis bearing whorls of weakly calcified primary laterals, dumb-bell shaped, presumably fertile (cladosporate), bent at tip, forming imbricate (overlapping) calcified quinxes. Short, phloiophorous secondary laterals are clustered at tip of the primaries. Dimensions: D= 1.7mm; d= 0.42mm; d/D= 25%; w= 9; w'=approx. 9; p= 0.15 mm; p'= 0.06 mm l= 0.65 mm; l'=0.06 mm. These values do not widely differ from the known species of Rajkaella. However, in Rajkaella sp. 1 the secondary laterals are fewer and shorter.

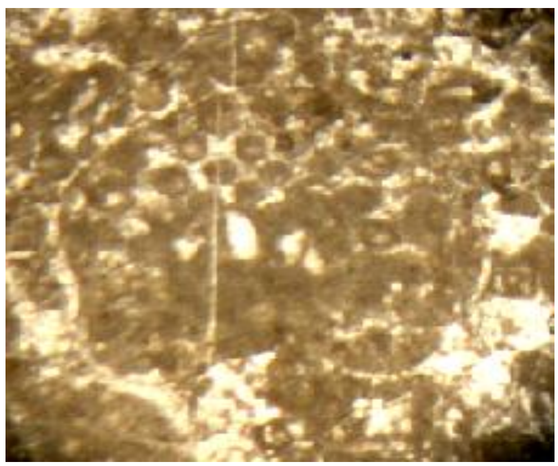

Fig. 2. Transversal section of Rajkaella sp. (Dasycladalean algae from the Esfiyukh Mountain), (Daragastan & Bucur, 1993), sample 108b, scale bar 0.7mm.

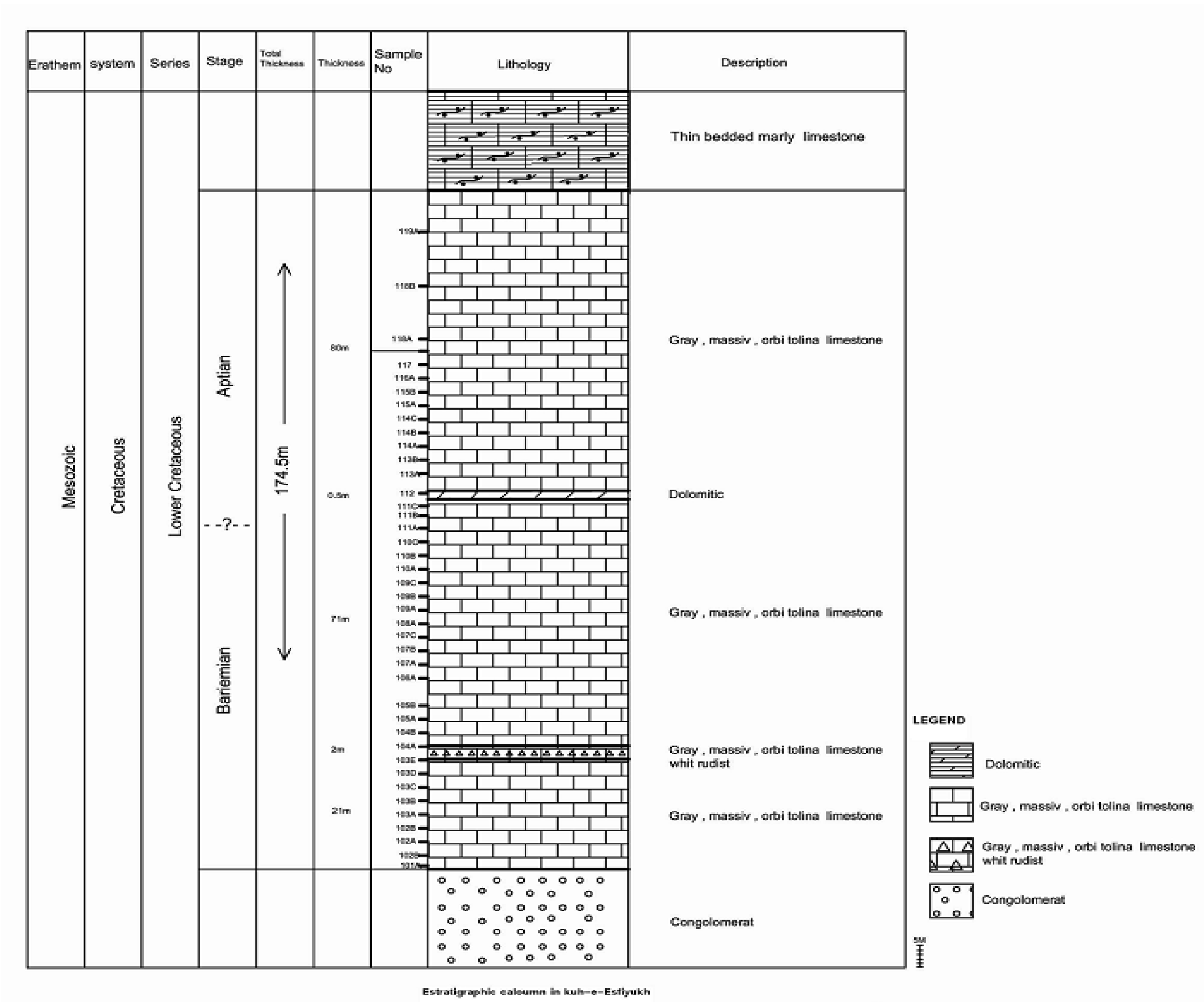

Fig. 3. Stratigraphy of Esfiyukh Mountain.

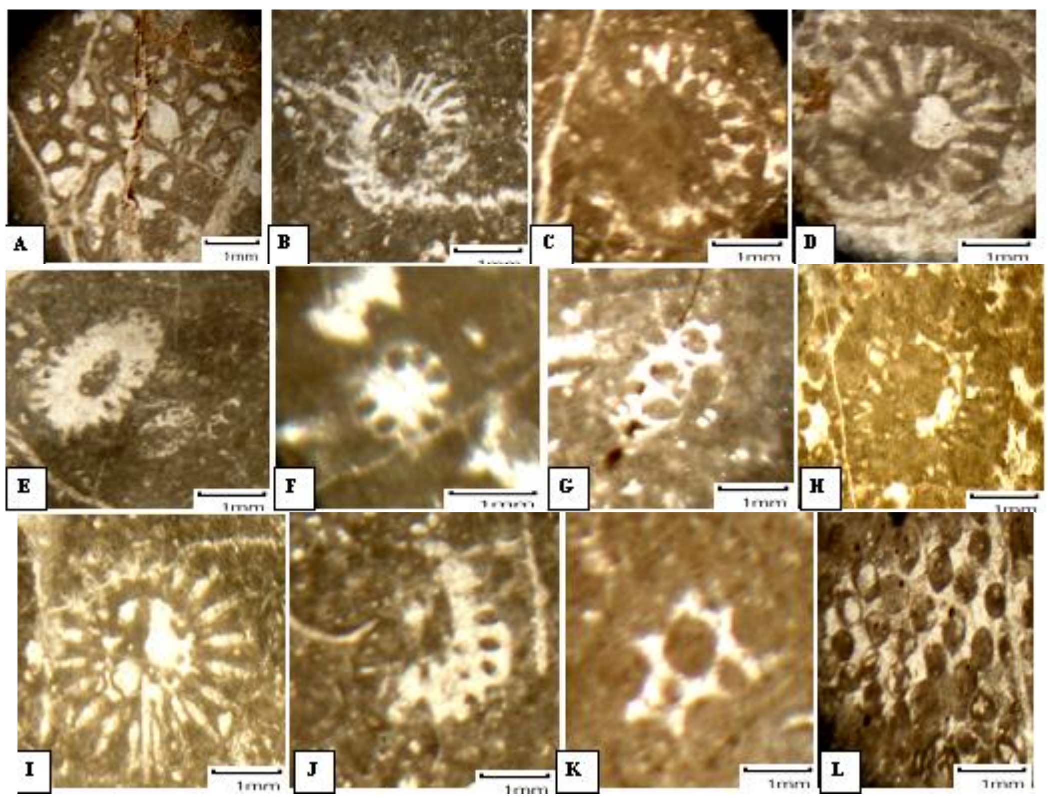

Fig. 4. Dasycladalean algae from the Esfiyukh Mountain: Plate 1

A. oblique- tangential section of Lithocodium aggregatum.(Elliot1956) sample 111c ,scale bar 0.8mm , B. oblique section of Salpingoporella parapiriniae(Carras et al2006), sample 107a ,scale bar 0.55mm C. incomplete almost transversal section of Falsolikanella danilovae(Granier et al.,2000), sample 105b ,scale bar 0.7mm D. transversal section of Triploporella? Sp.(Berger& Kaever,1992), (secondary laterals uncalcified or missing), sample 104,scale bar 0.7mm; E. oblique- tangential section of Salpingoporella sp.(Carras et al.2006), sample 106a ,scale bar 0.65mm , F. transversal section of Terquemella sp.(Radoicic1978), sample 108b ,scale bar 0.6mm G. oblique- tangential section of Neomeris sp.(Stewmann), sample 106c ,scale bar 0.6mm, H. transversal section of Boueina sp. sample 110a ,scale bar 0.8mm, I. incomplete almost transversal section of Triploporella sp. .(Berger& Kaever,1992)109c ,scale bar 0.8mm, J. tangential section Neomeris cretaceous.(Stewmann) sample 1106a ,scale bar 0.6mm, K. almost transversal section of Salpingoporella aff. hasi, (Carras et al2006) sample 145,scale bar 0.8mm., L. tangential section Cylindroporella sp.(Elliot-Azema et al.1979) 109a , scale bar 0.65mm.

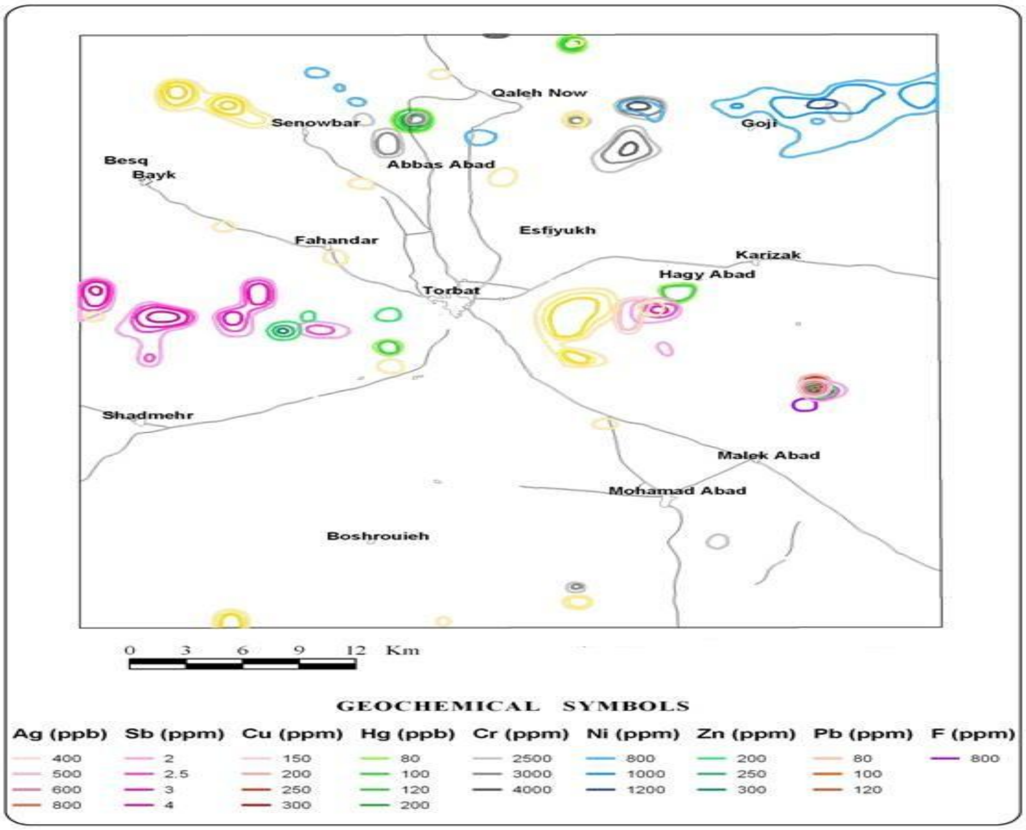

Fig. 5. Geographical Map of Esfiyukh.

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