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PETROGRAPHICAL AND MICROFACIES STUDY OF SINJAR FORMATION IN BAZYAN ANTICLINE, SULAIMANIYAH REGION (NORTHERN IRAQ)

Purpose. The work studies Sinjar formation (upper Paleocene – lower Eocene) within the Bazyan anticline in the Sulaimaniyah region (northeastern Iraq). The facies analysis is based on the petrographic study of limestone deposits and is essential to identify their nature. The sediments that formed Sinjar formation have a high content of skeletal granules which include a small amount of red algae and residues of unicellular organisms-foraminifera.

Methodology. The method of work included two main aspects: field study and laboratory work. The first part included the field description of the rocky excavation and modeling of 10 rocks samples from it within the Bazyan section. As for the second main aspect, it included the preparation of 10 slides for petrographic study of Sinjar Formation rocks followed by a facial analysis of these deposits.

Findings. Micro facial analysis showed that the sequences of Sinjar formation consist of three main facies. The wacky limestone facies bears benthic foraminifera. The facies of compact limestone bears the benthic foraminifera and red algae while the compact wacky limestone facies bears the fossils.

Originality. Wacky limestone facies bearing benthic foraminifera, compacted limestone facies bearing benthic foraminifera and red algae, and wacky limestone facies bearing benthic foraminifera were selected and studied. Thus, according to the facial analysis, Sinjar formation was deposited within the open shelf before the formation of the main deposit.

Practical value. Samples of rocks were obtained from the Bazyan anticline for further production of slides in order to study the facies of this anticline, which allowed showing its lithostratigraphic column.

Keywords: *petrographic analysis, micro facies, Sinjar formation, Bazyan anticline, Benthic foraminifera*

Introduction. The arrange of the Mega sequence AP 10 across the Zagross Fore deepens in the north-central Arabian Plate. Sinjar Formation (Paleocene-Lower Eocene) is part of this Mega sequence. The excellent surface exposure of Sinjar Formation First was described from the Jabal Sinjar area (Near Mamissa Village). It consists of 176 m of Nummulitic shoal facies and algal reef. The thickness of the formation is variable as in Derbendikhan area North East of Iraq where it is 120 m [1]. Also facies and depositional environments of Sinjar Formation from many selected sections in Sulaimaniyah city have been studied. Sinjar Formation is one of the less widespread units of the Paleocene-Lower Eocene cycle, where it is essentially distributed in an acute form and is to be found mainly in the foothills and southern parts of the high folded zones of Iraq.

The present article deals with the sediment logical study of the Sinjar Limestone Formation exposed in the Bazyan fold of Sulaimaniyah County in northeastern Iraq. In the present study samples were collected from exposed sections at Bazyan. The other attempt was made to reconstruct the depositional environment of the formation, which is composed of limestones. Khurmala and Sinjar Formations refer to the middle part of the tectonic stratigraphic AP 10 Mega sequence [1].

This mega sequence is of Middle Paleocene – Eocene age and includes six lithostratigraphic units in northern Iraq, namely Kolosh formation, Sinjar formation, Khurmala formation, Avanah formation, Gercus formation, and Pila Spi Formation. There are many studies on the units of this mega sequence regarding their stratigraphy, paleontology, and sedimentology Al-Barzanji, Sh. J. (1989). The mainly exposed part of Sinjar Formation is near the top of Sartak-Bamo, Tasluja, Baranan (Glazarda), Pirat (its southwestern limb), Haibat Sultan, Berke, and Bekhair Mountains. It has a thickness of 20–130 meters and is composed of massive, thick, or well-bedded highly fossiliferous limestone with occasional beds of dolomitic limestone [2]. The micro fossils and micro facies studies of carbonate rocks have significant importance due to more information or conclusions and results that derived from this type of studies, about all subjects which are related to the carbonate rocks, like chemical, biological components and structures. This research concerned with the study of the micro facies and micro fossils of Sinjar Formation. The topic of the research represents an approach to identification of carbonate micro facies and microfossils. Thus, our study is applied to an area extremely rich in Paleocene-Eocene represented by red algae.

Methods. The method of work included two main aspects: field study and laboratory work. The first part included the field description of the rocky excavation and the modeling of ten rocks samples from it within the Bazyan section. The investigated ten rock samples were collected along traverses in a direction barrel to the strike of beds of seven sections at chosen sites with a total number of ten rock samples in the study selected and systematic sampling was done on the basis of lithological and facies change. Two sections are along the main road which cut through the anticline. The first thickest section is from the type locality near the village of Kersi in the northern limb where the upper and lower boundaries of the formation are distinct. The second is along the southern limb where it starts from near Television Tower at the crest of the anticline and ends at the last bend of the road. As for the second main aspect, the laboratory one, it included the preparation of ten thin sections, analysis, which allowed the identification of facies, and petrographic study of Sinjar Formation rocks after treating them with red alizarin dye to distinguish calcite from dolomite.

The study area is located in the north-east of Iraq in Sulaimaniyah city within the Bazyan anticline, specifically the southwest wing of the anticline. The anticline is more than 24 km away from the city center. The studied area is located at longitude (517 917, 518 575) and latitude (3 929 208, 3 930 271) as shown in Fig. 1. From the tectonic point, the study area falls

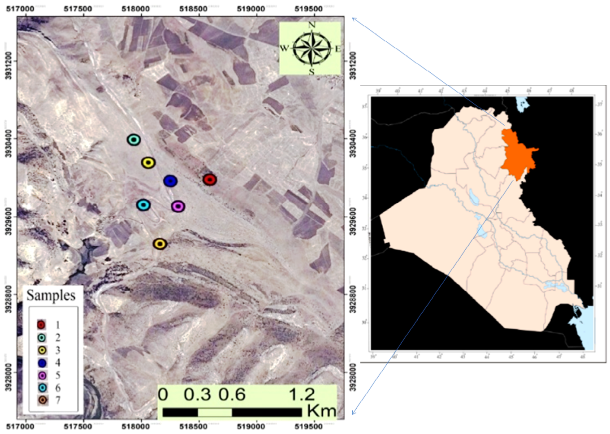

Fig. 1. Location of samples in the study area

within the range of high folds, as it is characterized by high mountains and severe folds [3]. Both Sinjar and Kolosh Formations are present in the Foot Hill Zone and on the southwest margin of the High Folded zone. According to [4] the south-west limit, the formation lies along a line crossing the Foot Hill Zone from the south limit of the Sinjar Trough to the Alan structure and passing through Demir Dagh, the northwest end of Kirkuk and the south-west margin of the High Folded Zone around Bawanur in the type area of the Kolosh Formation Ditmar V. (1971).

Results. ***Stratigraphy and Lithology of Sinjar Formation.*** Sinjar formation in the southwestern parts of Iraq is equivalent to the Aliji and Al-Rad formations in age, while facies is equivalent to Umm Radhuma and Akashat Jassim S. Z., Karim S., Basi M., Al-Mnbarak M. A. and Muniv J. (1984) in the eastern parts of Iraq is equivalent to the Khurmalah in age and facies equivalent Kolosh formation [5]. Sinjar (Eocene) Formations in Sulaimani and Dohuk area shown as outcropping, like a narrow belt in the boundary between Low and High Folded Zones. Khurmala Formation is the equivalent of temporal and spatial lagoonal one. The mainly exposed part of Sinjar Formation is near the summit of Tasluja, Baranan (Glazarda), Sartak Bamo, Haibat Sultan, Berke, Pirat (its southwestern limb) and Bekher Mountains. It is composed of massive, thick, or well bedded highly fossiliferous limestone with occasional beds of dolomitic limestone [2].

The sequences of the study area consist of thick layers of limestone of yellowish-gray color, argillaceous, conglomeratic (Fig. 2) and thin layers of dolomite; the thickness of the section is 9 m.

Fig. 3 shows the result and research, as for the exposed formations within the Bazyan fold, which are from the older to the recent formation of each; Kolosh Formation consists of mud stone, whose thickness does not exceed 1 m; Sinjar Formation consists of thick layers of limestone and thin layers of dolomite, the thickness of the section is 9 m, while Gercus Formation does not exceed thickness of 6 m), it consists of red clastic series and silt stone.

According to Lawa F. A. (2004), the lower contact between Sinjar formation and Kolosh formation is unconformity contact and the upper contact between Sinjar formation and Gercus formation is also unconformity contact.

Petrography. Classification of carbonate rocks was used [6, 7] dividing carbonate deposits mainly into grains (skeletal and non-skeletal) and Micrit, Sparite. 10 samples were carefully studied under a polarized microscope to describe the lithic components, their texture, and the fossil aggregates present in them. The facies components were described on their basis, and the modifications that occurred to them were identified with the identification of the types of porosity. The following is a description of the components diagnosed during the present study.

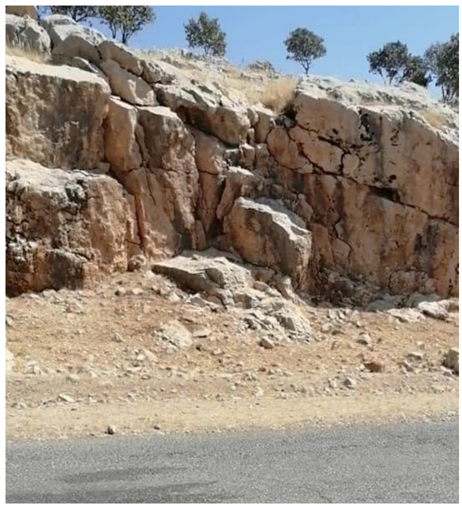

Fig. 2. Field photo image for Sinjar formation within Bazyan section

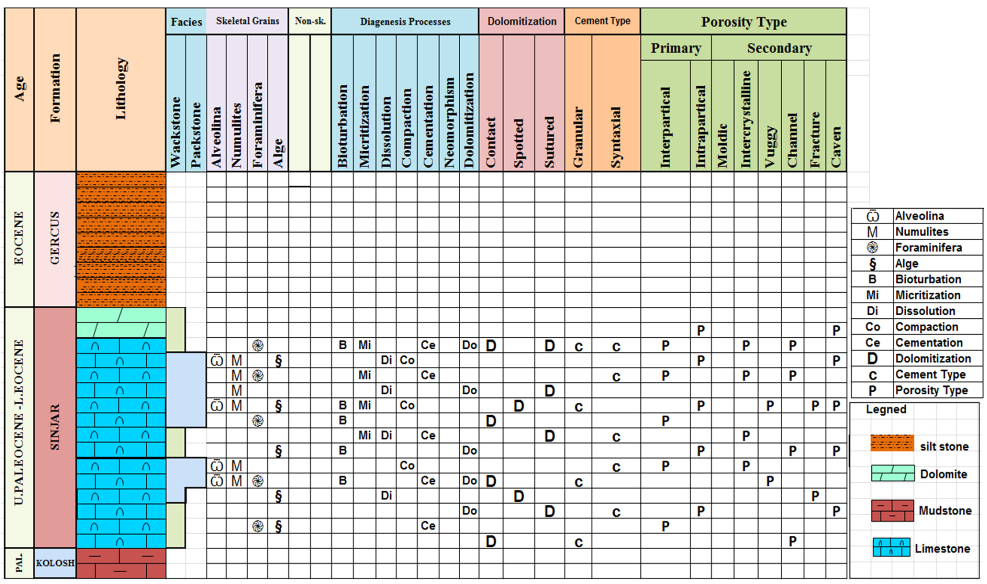

Fig. 3. Stratigraphy column and facies distribution of Sinjar formation (by the researchers)

Grains. Several nomenclatures were used to describe granular components whose sizes are greater than the sizes of the ground components in which they are present, and the granules include both skeletal granules (represented by complete fossil skeletons or parts of them) and non-skeletal ones and include peloids, pellet, and intraclast [7].

Skeletal granules. They are represented by the skeletal fossils and their parts as granules that present the main part of limestone to form Sinjar formation. The limestone facies of Sinjar formation are characterized by an abundance of fossils represented by the benthic foraminifera that include the general grains (Nummulite sp, Alveolina), Figs. 4, *A–C* as well as the diagnosis of red algae, Figs. 4, *C*, *D*. These clusters are abundant information rocks, according to several studies, including [8–10]. Non-Skeletal granules. The limestone rocks of Sinjar formation are characterized by their non-structural grains represented by pellet and clastic Figs. 4, *E*, *F*.

Matrix. The study on slides of limestone rocks showed that the matrix consists of micrite and sparite, according to [7] and feature the following:

1. Micrite. The Matrix consists of microcrystalline calcite crystals with a size of less than 4 microns whose granular components are embedded (Selley R. C., 2000). Micrite appears like a matrix within the facies of limestone rocks, as the micrite in the formation rocks is affected by the process of recrystallization and the transformation of the micrite into fine spar or affected by the process of dolomitization and transforming it into dolomite.

2. Sparite. It is in the form of large calcite crystals that are distinguished from micrite by their larger size. These crystals are formed in ancient limestone rocks by recrystallization of primary lime grains, sedimentation, or micrites into fine spars.

Diagenesis process. This process includes all the physical, chemical and bio changes that occur in limestone, starting from the moment of deposition until it acquires the state of petrification (Tucker M. E., 1982). Some of the most important morphological processes affecting limestone rocks of the study area, which were distinguished under the polarized microscope, are dissolution, dolomitization, recrystallization, while quartz and cement were distinguished under the microscope, but in small ratios.

Dissolution is one of the most important diagenesis processes that occur in limestone rocks, which leads to the occurrence of porosity in the rocks called secondary porosity, due to the dissolution of rock components that have the ability to dissolve [11], shown in Fig. 5, *E*, while dolomite is formed as a result of change in the magnesium ion instead of Calcium ion, so dolomite mineral is formed as a result of primary deposition or as a result of modification processes. The dolomitization process leads to an increase in the porosity [12] and through the study of thin slides, it was observed that very fine crystals of dolomite mineral formed during the modification processes, which is shown in Fig. 5, *D*.

As for the recrystallization process, it effects the skeletal and non-structural grains, as the micrite is partially or completely transformed into fine spar [13] as shown in Fig. 5, *F*.

Facies analysis. The facies analysis depends on the petrographic study of limestone rocks and the associated sediments to identify the nature of those rocks [14]. The sediments that formed Sinjar formation have high content of skeletal granules. Foraminifer is the main component of skeletal granules and a few red algae and organism debris. The most important transformational processes affecting the formation rocks are the process of dissolution, dolomitization, micritization, and cementation, depending on the petrographic components (matrix and granules) according to the classification of this through the petrographic study and depending on the rock contents of the granules [6].

Sinjar formation was divided into three facies as shown in Fig. 3, Table, and compared with standards facies and living zones suggested by [14, 15] to estimate the sedimentation environment. The following is a description of the diagnosed facies.

Benthonic Foraminiferal lime wackestone microfacies. The benthic foraminifer in this facies constitutes approximately 30 % of the total skeletal granules represented by the genera (Alveolina, Nummulites sp) Fig. 5, *A* and 5 % of the non-skeletal granules, where these facies are located in the lower, mid-

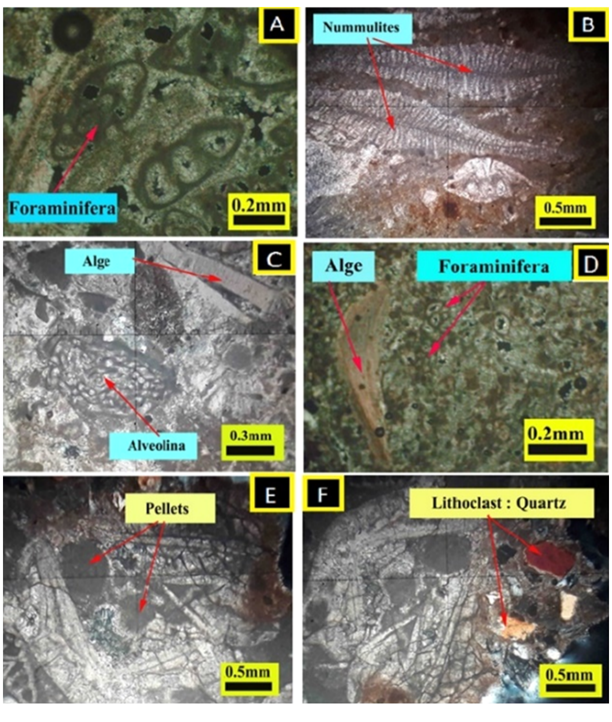

Fig. 4. Skeletal and non-skeletal grains:

A – Benthonic Foraminifera; B – Nummulites S; C – Alveolina & Alge; D – Benthonic Foraminifera & Alge; E – Pellet; F – Lithoclasts

Fig. 5. Microfacies and Diagenetic process:

A – Benthonic Foraminifera wackestone Microfacies; B – Benthonic Foraminifera – Red Alge packstone Microfacies; C – Fossiliferous wackestone – packstone Microfacies; D – Dolomitization within Nummulites; E – Vuggy porosity and Cementation process; F – Intercrystalline porosity dle, and upper parts of the formation (Fig. 3). In this facies calcite and dolomite are found, as well as sparite and micrite at a rate of 65 %. Diagenesis presses that affected these facies are dissolution (porous molding) and dolomitization (Fig. 5, *D*). These facies appear in the upper part of the formation. These facies are similar to the standard facies (SMF-9) deposited within the facies zone (FZ-7) according to Classification [14, 15], which represents the open sea environment (open sea shelf).

Benthonic Foraminifera – Red Algae lime packstone Microfacies. These facies were identified within Sinjar Formation sediments, which appear in the central part of the formation (Fig. 3), which contain between 50–90 % of skeletal and non-structural grains ranging according to the classification of [6]. The benthic foraminifera in this facies consist of approximately 50–60 % of the total skeletal granules presented by the genera (Alveolina, Nummulites sp). In addition, red algae were found with a lower percentage (Fig. 5, *B*), as well as non-skeletal granules within this facies with the percentage of 15–10 % represented by Pellet, Lithoclastic. The diagenesis processes affecting these facies are Micritization, dolomitization, and dissolution, represented by moldic porosity, intergranular porosity, intercrystalline porosity, and cementation (Fig. 5, *E*). These facies appear in the middle part of the formation and they are similar to the standard facies (SMF-8) deposited within the facies zone (FZ-7) according to the classification of [14, 15], which presents the open sea environment (open sea shelf).

Fossiliferous lime wackestone – packstone Microfacies. This facies was identified in the middle part of the formation, which contains a percentage of skeletal grains between 30–60 % represented by the genera (Alveolina, Nummulites sp) (Fig. 5, *C*). Also, sparite and micrite were found as cement at a percentage of 30–65 %. Diagenesis processes affecting these facies are micritization, dolomitization, dissolution (moldic porosity, intergranular porosity, intercrystalline porosity, Fig. 5, *F*), and cementation. These facies appear in the middle part of the formation (Fig. 3). These facies are similar to the standard facies (SMF-8) deposited within the facies zone (FZ-7) according to the classification of [14, 15], which represents the open sea environment (open sea shelf).

Depositional environment. The ancient environmental conditions can be determined by studying the rock characteristics of these sediments and diagnosing their textures and micro facies, as well as diagnosing the types of bio crowd that are present in them. Many researchers have shown that the sedimentary environment of Sinjar formation was deposited in the environment of the reef according to [16], while Bellen V. R. C., Dunnington H. V., Wetzel R. and Morton D. M. (1959) explained that the formation rocks were deposited in three environmental locations (Back reef, reef, fore reef) [17], while [18, 19] agreed that the collection of benthic foraminifers, especially Alveolina and Nummulites, accompanied by algae, represents Fore reef. Sinjar Formation may be was deposited in many environments but predominantly in shallow water fore-reef, reef, and lagoonal environments through cycle (upper Paleocene-Lowe Eocene), bordered from lower by clastic Kolosh Formation and upper bordered by Gercus Formation (Eocene) Al-Surdashy A. M. A. (1988). The depositional environment of Sinjar formation is shallow marine (Reefal) environment.

During the current study, three main facies were distinguished within the rocks of Sinjar Formation, which are the wacky limestone facies bearing benthic foraminifera, the facies of compact limestone bearing the benthic foraminifera – red algae, and the compact wacky limestone facies – bearing the fossils. Within these facies, much benthic foraminifera spread following (Alveolina, Nummulites sp) that live in the areas of reef in shallow marine waters with high currents [7]. The nature of the sedimentary basin during the Eocene period was characterized by its shallowness towards the northeast and the increase in the depth of the basin towards the southwest [20]. With the beginning of the Eocene era and after the total consumption of the new Tethys Sea crust, a collision occurred between the passive edge of the Arab plate and the effective edge of the Iranian and Turkish plates. The lithology of these two different edges became deposited in sequence beside to each other in sedimentary and tectonic [21]. Because of this collision, a lifting operation took place at the edges of the Iranian and Turkish layers and it led to deposition of the red layers represented by the formation of Jerkas, also the rise of Listerian faults in the land area, which resulted in the rise of one region and the depression of another. In addition, shallow seas and lagoon basins formed on the edge of the Arabian plate. In these seas, micro facies of Sinjar formation developed.

Fig. 6 represents the sedimentary model of the study area, which shows the stratigraphy of the shallow micro facies of Sinjar Formation over the deep micro facies of Kolosh Formation.

Conclusions. The current study reached the following results:

1. The petrographic study showed that Sinjar formation within the Bazyan fold in the current study is composed mainly of benthic foraminifera represented by the genera (Nummulites sp, Alveolina) and red algae with lower percentages of organic clastic.

2. The petrographic study added that the formation rocks were affected by the diagenesis processes, the most important of which are dolomitization, micritization, cementation and dissolution (moldic porosity), (intergranular porosity), (intercrystalline porosity), and cementation.

3. The facies study showed three main facies, which are: *A* – the wacky limestone facies bearing benthic foraminifera; *B* – the facies of compact limestone bearing the benthic foraminifera – red algae; *C* – the compact wacky limestone facies – bearing the fossils.

Table

Microfacies of Sinjar Formation

Microfacies Dunham (1962)	Diagnostic features (main skeletal grain +common diagenetic process)	Equivalence to Wilson (1975) SMF
Lime wack stone	Alveolina + Numulites sp Dolomitization + solution	SMF- 9
Lime pack stone	Alveolina + Numulites sp + lithoclasts Dolomitization + solution + Micritization + Recrystalization + cementation	SMF-8

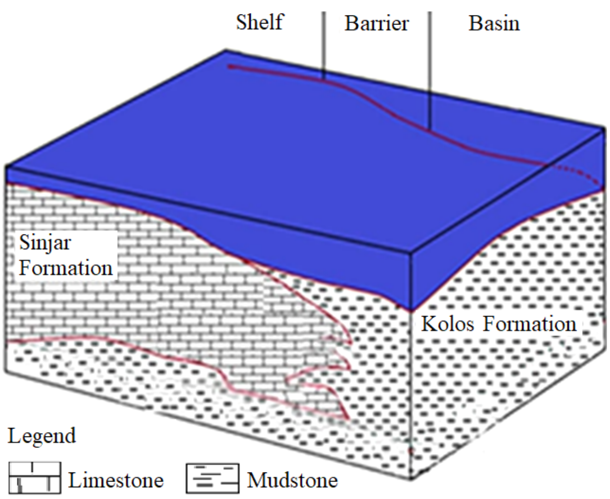

Fig. 6. Depositional model of Sinjar formation (by the researchers)

4. The depositional environment was found open sea shelf at the fore reef.

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References.

1. Sharland, P. R., Archer, R., Casey, D. M., Davies, R. B., Hall, S. H., Heward, ..., & Simmons, M. D. (2001). *The Chrono-Sequence Stratigraphy of the Arabian Plate*. GeoArabia Special Publication.
2. Ahmad, K. H. K. (2016). Facies Changes between Kolosh and Sinjar Formations along Zagros Fold–Thrust Belt in Iraqi Kurdistan Region. *Journal of Geography and Geology, 8*(1). https://doi.org/10.5539/jgg.v8n1p1.
3. Jassim, S. Z., & Goff, J. C. (2006). *Geology of Iraq*. Dolin, Prague and Moravian Museum, Brno.
4. Buday, T., & Jassim, S. Z. (1987). Tectonism, Magmtism and Metamorphism. In *The Reginal Geology of Iraq*. Baghdad.
5. Buday, T. (1980). *The regional geology of Iraq, stratigraphy and paleography: Dar AI-kutub*. Pub1ishing House Mosule, Iraq.
6. Dunham, R. H. (1962). Classification of carbonate rocks according to depositional texture. In Ham, W. E. (Ed.). *Classification of carbonate rocks: American Association of Petroleum Geologists Memoir, Vol. 1*, (pp. 108-121). https://doi.org/10.1306/M1357.
7. Flugel, E. (2010). *Microfacies of carbonate rocks-analysis, interpretation and application*. Springer, Verlag, Berlin, Heidelberg.
8. Al-Dulaimi, E. K., & Al-Dulaimi, S. I. (2017). A Study of Biostratigraphy of Sinjar Formation in selected sections from northern Iraq. *Iraqi Journal of Science, 58*(2B), 891-916.
9. Basso, D., Fravega, P., & Vannucci, G. (1996). Fossil and living corallinaceans related to the Mediterranean endemic species Lithophyllum racemes (Lamarck) fossil. *Facies, 35*, 275-292. https://doi.org/10.1007/BF02536965.
10. Braga, J. C., & Aguirre, J. (1994). Taxonomy of fossil coralline algal species: Neogene Lithophylloideae (Rhodophyta, Corallinaceae) from southern Spain. *Review of Palaeobotany and Palynology, 86*, 265-285. https://doi.org/10.1016/0034-6667(94)00135-7.
11. Preseut, T. M., Adkins, J. F., & Grotzinez, J. P. (2017). *Digenetic Systematic of Carbonate facies of the yate, Capitan and Bell canyon formations, Guadalupe Mountains National Park*, (pp. 15-28). Tx. AAPG Houston, Texas.
12. Warren, J. (2000). Dolomite: Occurrence, Evolution, and Economically Important Association. *Earth-Science Reviews, 52*, 1-81. https://doi.org/10.1016/S0012-8252(00)00022-2.
13. Boggs, S.J. (2006). *Principles of Sedimentology and Stratigraphy*. (*4th* ed.). Person Prentic-Hall.
14. Flügel, E. (2004). *Microfacies of Carbonate Rocks: Analysis, Interpretation and Applications*. Berlin: Springer-Verlag. https://doi.org/10.1007/978-3-662-08726-8.
15. Wilson, J. L. (1975). *Carbonate facies in geologic history*. Berlin: Springer-Verlag.
16. Henson, F. R. (1950). Cretaceous and tertiary reef Formation and associated sediments in Middle East. *AAPG Bulletin, 34*, 215-238. https://doi.org/10.1306/3D933ED2-16B1-11D7-8645000102C1865D.
17. Anketell, J. M., & Mriheel, I. Y. (2000). Depositional environment and diagenesis of the Eocene Jdeir Formation, Gabes-Tripoli basin, western offshore, Libya. *JPGS, 23*, 425-447. https://doi.org/10.1111/j.1747-5457.2000.tb00495.x.
18. Chose, B. K. (1977). Paleoecology of the Cenozoic reefal forminifer and algae-A brief review. *Palaeogeography Palaeoclimatology, Paleoecology, 22*, 231-256. https://doi.org/10.1016/0031-0182(77)90030-X.
19. Vennin, E., Van Buchem, F. S. P., Joseph, P., Gaumet, F., Marc, S., Rebelle, M., ..., & Zijistra, H. (2003). A 3D outcrop analogue model for Ypresian nummulitic carbonate reservoirs: Jebel Ousselat, northern Tunisia. *Petroleum Geoscience, 9*(2), 145-161. https://doi.org/10.1144/1354-079302-505.
20. Jassim, S. Z., & Buday, T. (2006). Middle Paleocene–Eocene Megasequence (AP 10). In: Jassim, S. Z., & Goff, J. C. (Eds.). *Geology of Iraq*, (pp.155-167). Dolin, Prague and Moravian Museum, Brno.
21. Numan, N. M. (1997). A plate tectonic scenario for the Phanerozoic succession in Iraq. *Iraqi Geological Journal, 30*(2), 85-110.

Петрографічні та мікрофаціальні дослідження Синджарської світи в Базійській антикліналі, регіон Сулейманія (Північний Ірак)

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Мета. У роботі досліджується Синджарська світа (верхній палеоцен – нижній еоцен) у межах Базійської антикліналі в регіоні Сулейманія (північний схід Іраку). Фаціальний аналіз ґрунтується на петрографічному дослідженні вапнякових відкладень і є необхідним для визначення їх природи. Опади, що сформували Синджарську свиту, відрізняються високим вмістом скелетних гранул, які включають невелику кількість червоних водоростей і залишків одноклітинних організмів-форамініфер.

Методика. Методика виконання роботи включала два основні аспекти: польові дослідження й лабораторні роботи. Перша частина – польовий опис скельної виїмки й моделювання 10 зразків гірських порід з неї в межах Базійського розрізу. Що стосується другого основного аспекту, то він включав підготовку 10 шліфів для петрографічного вивчення порід Синджарської світи з наступним фаціальним аналізом цих відкладень.

Результати. Мікрофаціальний аналіз показав, що послідовність пластів Синджарської світи складається із трьох основних фацій. Химерна за формою вапнякова фація містить бентосні форамініфери. Фація щільних вапняків містить бентосні форамініфери та червоні водорості, і третя компактна фація химерних за формою вапняків, що містить скам'янілості.

Наукова новизна. Були виділені й досліджені: вапнякова фація, що має химерні форми та містить бентосні форамініфери; фація ущільнених вапняків, що містить бентосні форамініфери та червоні водорості; химерна за формою компактна фація вапняку, що містить бентосні форамініфери. Таким чином, згідно з фаціальним аналізом, Синджарська світа відклалася на відкритому шельфі перед початком формування основного покладу.

Практична значимість. Із Базійської антикліналі були взяті зразки гірських порід для подальшого виготовлення шліфів з метою вивчення фацій цієї антикліналі, що дозволило показати її літостратиграфічний розріз

Ключові слова: *петрографічний аналіз, мікрофації, Синджарська світа, Базійська антикліналь, бентосні форамініфери*

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