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PETROGRAPHIC STUDY ON JURASSIC PROFILE NEAR MÁRIAKÉMÉND VILLAGE, SOUTHERN BARANYA HILLY COUNTRY, S HUNGARY

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ABSTRACT

On the basis of the study on profile of the quarry near Szederkény village between the Mecsek and the Villány Mountains, it can be stated that it is mostly built up by slope facies formations. Presumably, there was a near subaerial, shallow marine facies that supplied the bioclast material (mostly crinoid calcarenite) getting the slope. Pelitic sediments with siliceous sponge and pelagic planktons were formed during the periods of rest between the given sediment transports.

By the characters of the sedimentation this sequence can be divided into three parts, and, within these, two zones formed by intensive gravitational transport can be interpreted. These zones are characterised by crinoid allodapic limestone, lithoclastic limestone and calcareous marl. Other parts of the sequence are also dominated by slope facies. However, the open marine pelitic sediment is also important as a consequence of the more moderated intensity of the transportation.

Three facies of the Upper Liassic-Lower Dogger sequence in the Mecsek Mountains (the plateau facies Pusztakisfalu Limestone, the basin facies Komló Calcareous Marl, and the intermediate slope facies) probably coexisted for long time: interdigitation and closed connection of their formations are characteristic for this period.

INTRODUCTION

Between the Villány and the Mecsek Mountains – in the area of the Southern Baranya Hilly Country – formations of the basement crop out in some places. First works about the area – PETERS (1862), SZABÓ (1867), LENZ (1872) – were only outlined description of rocks exposed in the quarries that were intensively mined at that time. By some fossils SZABÓ (1867) and LENZ (1872) regarded the beds to be Liassic and Upper Jurassic, respectively. The first more detailed description can be found in the report of LÓCZY Jr. (1912). Summarising the tectonic arguments, he brought the outcrops covered by loess and included by the E-W hill range into connection with the SE end of the Mecsek Mountains. According to him, strike of the beds is NNE, their inclination is 312/15°, and their age is Middle Liassic. On the basis of the former published fossils and analogy of rocks near Ófalu village, VADÁSZ (1913) dated the outcrops as Lower Dogger. According to him in Máriakéménd village grey and yellowish cherty-sandy layers "with crinoid-like forms" are exposed. In his classic monograph of ammonites in Villány Mountains, LÓCZY Jr. (1915) mentioned petrified tree-trunk remains in this area. He supposed the original environment to be alongshore facies, and he concluded that rock material of the "blocks" deposited in an enclave of the Liassic-Dogger sea of the Mecsek Mountains. In his monograph entitled

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"A Mecsekhegység" (The Mecsek Mountains), VADÁSZ (1932) completed the fauna that had been known; he dated the exact origin of the rocks in the Aalenian Stage by the analogy of the Crinoid-bearing limestone near Ófalu and Pusztafalu villages, and by emphasising their difference from the marly formation of the Mecsek Mountains that he regarded as a heteropic one. VADÁSZ also mentioned this beds in his lecture book entitled "Magyarország földtana" (Geology of Hungary) published in 1960. He supposed the original environment as a calm, shallow sea that was not deeper as a subneritic one, and he identified the pelitic material of the sediment to be terrigenous. Using results of geophysical and geological studies BARANYAI and JÁMBOR (1962) attempted to compile the map of basement of the SE Transdanubia. This map shows Middle Jurassic formations in a narrow zone of E-W strike in line of Monyoród-Bár villages. The most detailed description of the surface outcrops has been given by KASZAP (1963). He completed the fauna with foraminifer forms, which supported its stratigraphic position in the Aalenian stage determined by belemnites and brachiopods. In his description of the quarry near Szederkény village, he divided the profile into two parts. Crinoid limestone with pale red or grey chert lens is characteristic for the lower part, while the upper part is characterised by thin-bedded, highly weathered, frequently friable cherty limestone and chert. He mentions clay, quartz grains, sponge skeletal components, and remains of siliceous foraminifers, ostracodes, gastropods and radiolarians in the insoluble residue. Beds with purer lime content contain brachiopods, belemnites and ammonites. In the higher "member", there are crinoid parts in the chert. According to KASZAP it can be interpreted as a result of syngenetic silicification. He described sponge skeleton elements in the elutration and insoluble residue of the green, micaceous, sandy as well as calcareous clay layers. According to him, inclination of the beds is 360/8°, 345/16°, 45/20°. The neighbouring profile near Máriakéménd village, and outcrops near Versend and Székelyszabar villages are sketchy characterised in his paper, too. Barabás et al. (1964) call attention to the feature that Aalenian crinoid, cherty limestone in the Máriakéménd-Bár range petrographically and faunustically has a Mecsek type facies, although, tectonically it should be Villány type. WEIN et al. (1966) and WEIN (1967) regard the formations of this zone as nearshore facies. In his diploma work, SCHLEMMER (1984) made a detailed analysis of Jurassic columns of boreholes Somberek 1 and Máriakéménd 3, and divided the formations into 13 microfacies types. This study was completed by sedimentological and mineralogical analysis of the samples. In his opinion, these formations do not show a transition to formations of similar age in Villány Mountains, but, together with Middle Jurassic beds of the Mecsek Mountains, they were formed in a complete basin system. He supposes that in this interval there was topographically accentuated basin area in which the slope facies sedimentation occupied the greatest area. The Pusztakisfalu Limestone formed on plateaus, near crinoid communities. Sedimentation in the deeper, inner parts of the basin is characterised by pelitic, aleuritic, carbonate deposit (Komló Calcareous Marl). He stated that these three facies coexisted for a long time during the Upper Lias - Lower Dogger, their formations are characterised by interdigitation and closed connection, and gave example for postponement of spreading area of the facies.

This work presents a petrographic and microfacies study of profile in the old, abandoned quarry lying 2 km to the south of Máriakéménd village and belonging administratively to Szederkény village (*Fig. 1*).

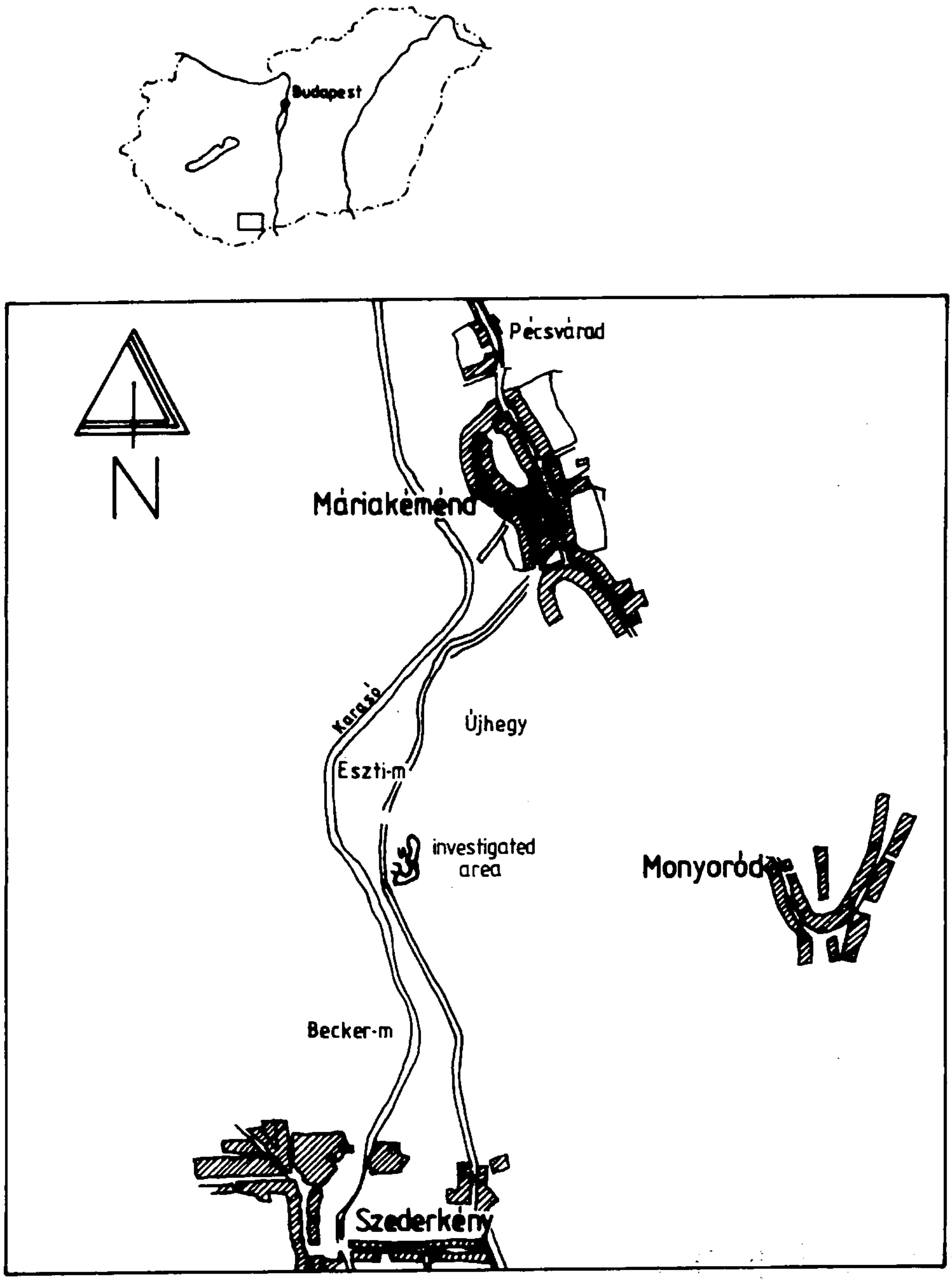

Fig. 1. Location map of the studied outcrop

GEOLOGICAL SETTING

The Mecsek and the Villány Mountains are two classic and well-exposed Mesozoic areas of the Tisza Unit. In the basin between these areas, there are Triassic and Jurassic beds outcropping from below younger formations, and form a part of the emerged Mesozoic Máriakéménd-Báta Range. This tectonic unit belongs to the Villány zone, possibly to its northernmost reverse fault (nappe?) of NNW vergence (*Fig. 2*), however, it is questionable how the stratigraphic features of the Villány Mountains are valid for the whole zone (BARABÁS et al. 1964; KŐRÖSSY 1982; SCHLEMMER 1984). This uncertainty is particularly sharp in our case because formations as old as our profile of Aalenian age (VADÁSZ 1935; KASZAP 1963) has not been pointed out in the Villány Mountains. However, Jurassic beds in the Mecsek zone near Pusztakisfalu and Ófalu villages contain layers of the same age and similar facies (PETERS 1862; VADÁSZ 1935; HETÉNYI et al. 1972; PATAKY et al. 1982). According to the issue of "Magyarország mélyfúrási alapadatai" (Drilling basic data of Hungary), in the drillings of the Máriakéménd-Báta range there is an erosion interface between the Jurassic formations and the Middle Triassic Csukma Dolomite. Traversed thickness of the Jurassic formations in the boreholes Máriakéménd No. 3 and Somberek No. 1 is 70 and 542 m, respectively.

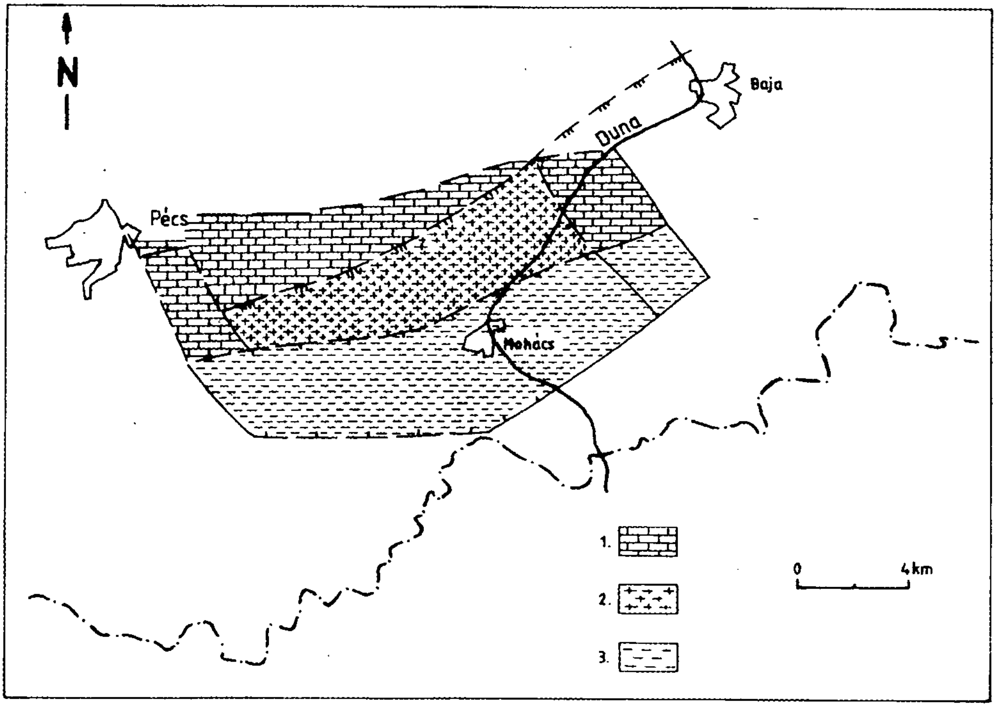

Fig. 2. Uncovered geological sketch map of SE Transdanubia
Legend: 1: Middle Triassic carbonate formations, 2: Máriakéménd-Báta range, 3: Cretaceous formations

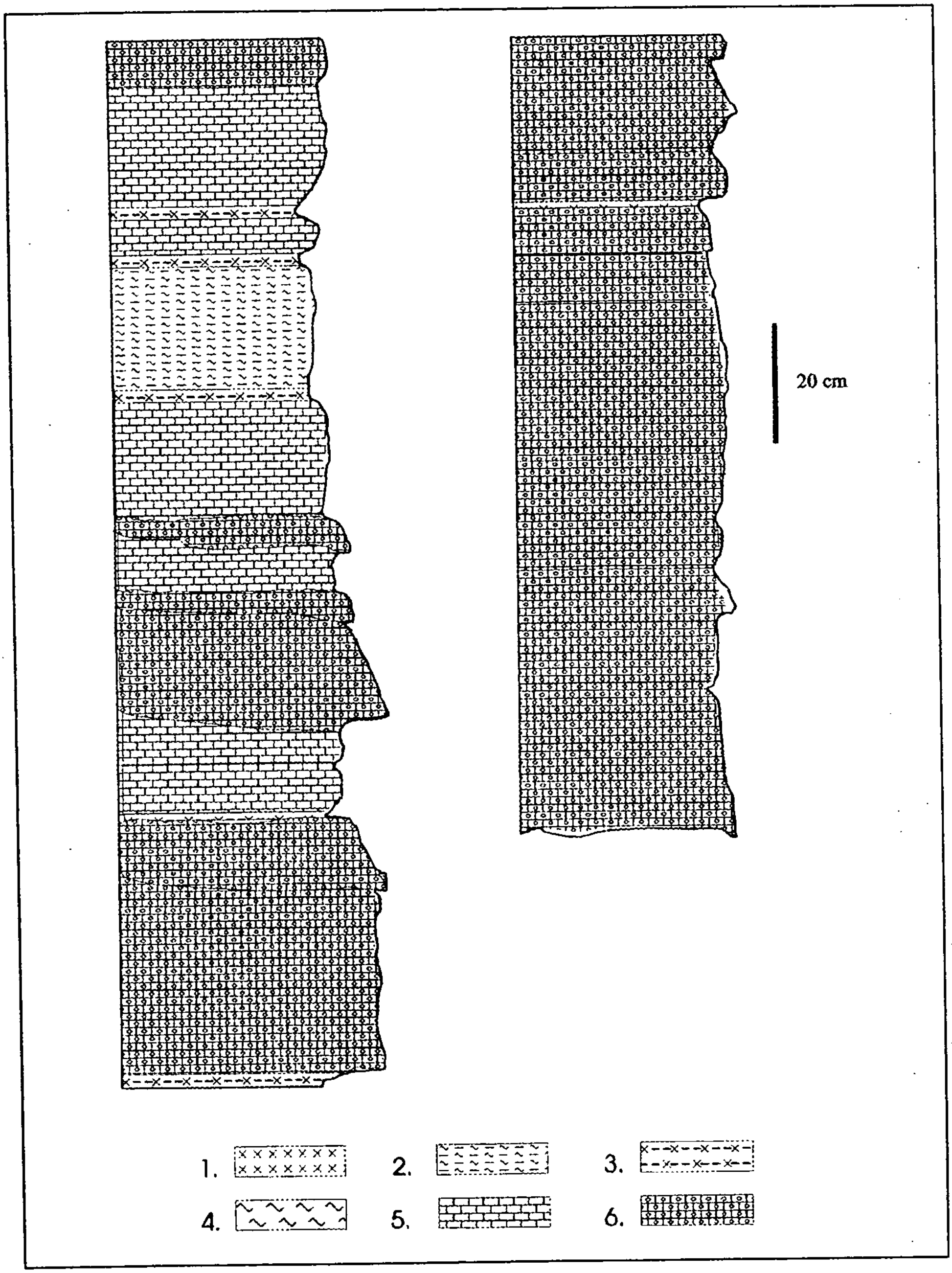

Fig. 3a. Section 1 of the profile
Legend:
1: spongiolite, 2: aleuritic cherty calcareous marl, 3: sericitic clay and clayey marl with spicules
4: clayey aleuritic marl, 5: clayey aleuritic crinoidal limestone, 6: coarse sparry allodapic crinoidal limestone

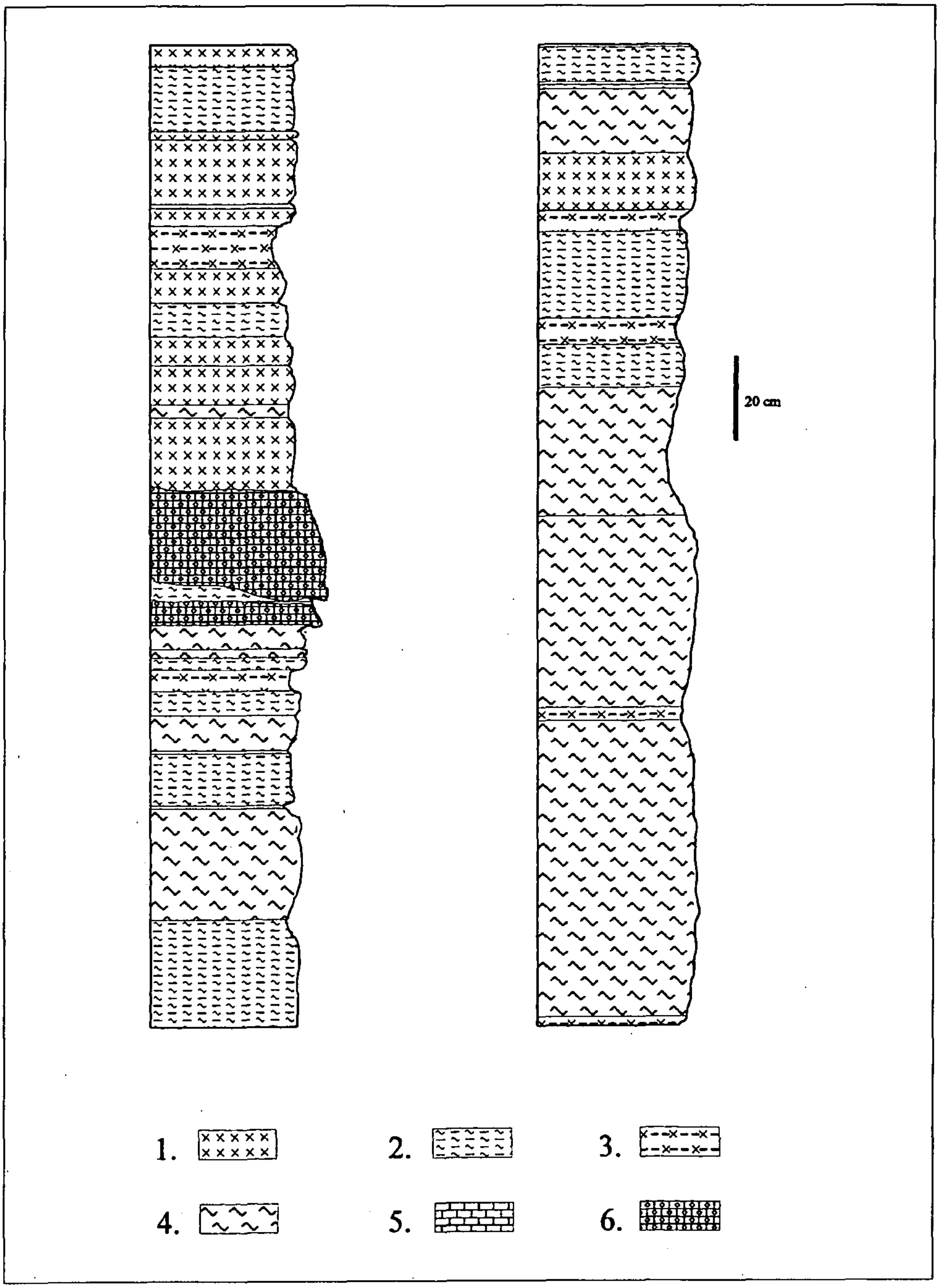

Fig. 3b. Section 2 of the profile
See figure 3a for legend.

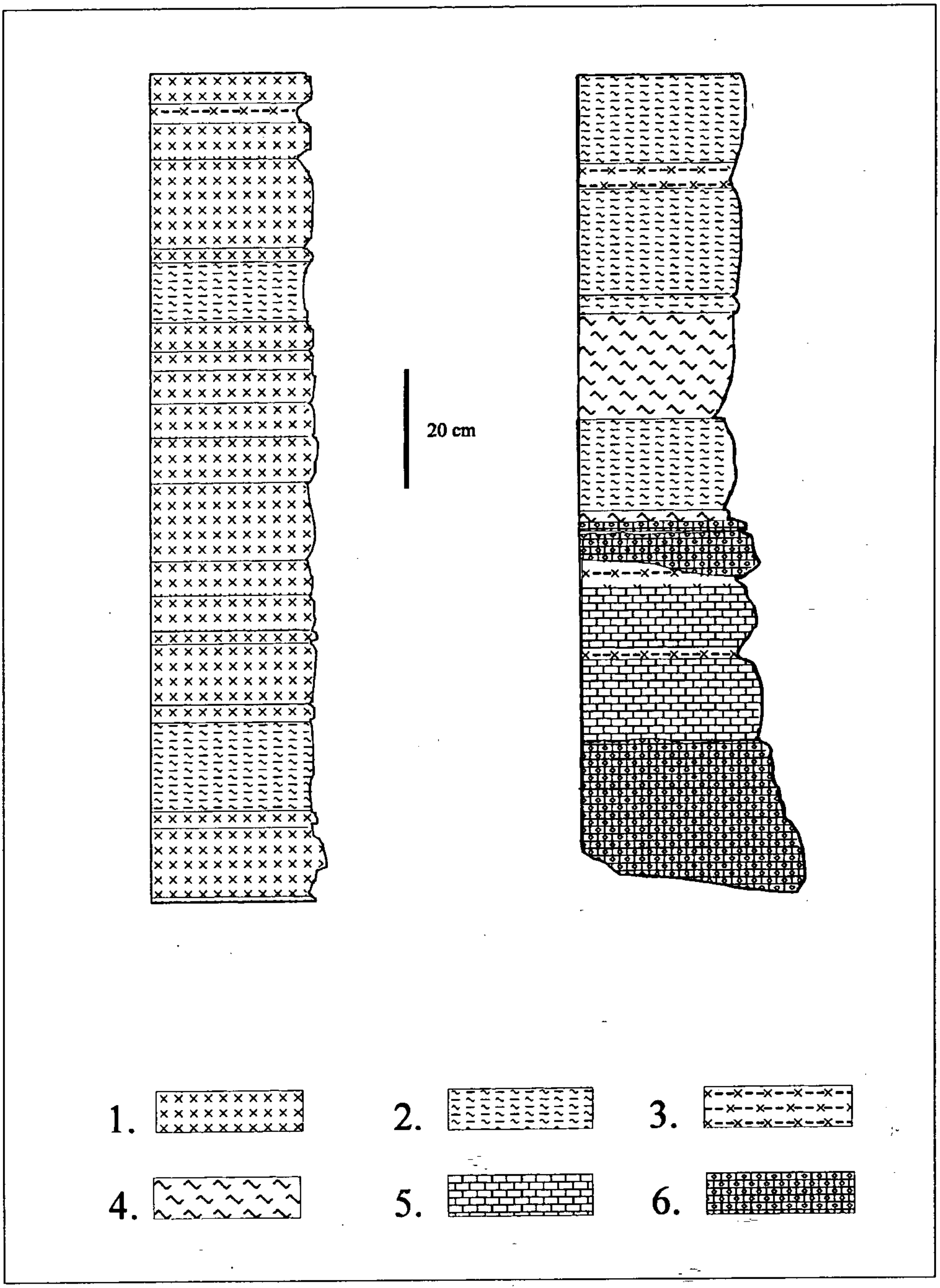

Fig. 3c. Section 3 of the profile
See figure 3a for legend.

PETROGRAPHY

The profile is built up by rocks with undulate bedding surface. Cross-stratification, mechanoglyphs on the underlying or overlying planes have not been mentioned, and I do not notice these features, either. In the lower part of the profile, characteristically over the red, sparry crinoid limestone layers, some allodapic crinoid limestone layers can be found. These layers have strikingly undulate surface, and have laterally extremely varying thicknesses, which can be a stressed diagenetic bedding form. It can not be excluded, however, that these might be diagenetically modified primary "channel" structures. Lack of proper marks, however, directions of flow and transportation can not correctly be concluded.

By macroscopic observation, the following rock types can be distinguished:

a) pale red, slightly sandy and/or aleuritic, coarse sparry, in some places cherty, crinoidal, in some levels allodapic limestone;

b) greenish yellow or brownish red, clayey, aleuritic, in some levels lithoclastic, crinoidal limestone, calcareous marl, allodapic limestone;

c) greenish grey, in altered state porous and white, aleuritic, calcareous marl, marl with chert nodules.

d) grey, in altered state porous spongiolite.

Beds of these rock types are separated from each other by strings of vivid green, sericitic clay and clayey marl. Borders of pure crinoidal limestones and these strings are very sharp, while the transition is gradual in the case of more clayey and cherty layers. Siliceous spicules, foraminifer fragments and aleurite of quartz can be identified in its washing residue.

The column can be divided into three parts on the basis of field observation completed by microfacies analyses:

1) Layers 1-34 belong to the first section ranging from the base to 3.10 m height of the quarry (*Fig. 3a*). Its dominant rock type is a red, sparry crinoidite, which is quite pure at the lower part (*Fig. 4*). At the upper part, it is often slightly (rarely highly) cherty. At some levels, the rock contains more clayey, greenish lithoclasts of millimetres (*Fig. 5*).

Microfacies of this section is characterised by the following types:

Echinoderm grainstone occurs at the base of the section, which did not show mark for gravitational redeposit in thin sections. Its fragments are well-rounded or subrounded, middle sorted bioclasts. Beside echinoderms it contains some percents siliceous spicules and mollusc fragments. Syntaxial sparry cementation can be observed around the skeletal elements (*Fig. 6*). All samples contain about 5 % unrounded quartz grain. In the more cherty samples, the sparry cement may be substituted by calcedony (chert). It can be observed in several cases that sandy echinoderm grainstone and foraminifer, spicule, bositra packstone touch with each other along a sharp border. Echinoderm grainstone totally composes of lower sorted crinoid skeletal elements cemented by syntaxial calcite. In the cases of sharp boundary surface between echinoderm grainstone and with clayey limestone of packstone texture, gradation of echinoderm grainstone can be observed, which suggests allodapic origin of the calcarenite (FLÜGEL 1978 *Fig. 7*).

Directly above the purest crinoidites, the lithoclastic crinoidal limestones generally has packstone texture. Some samples can be regarded as calcareous marl because of the higher clay content. In some samples it can be observed that the sparry grainstone texture groundmass and the packstone micrite one occur together, and they include the darker,

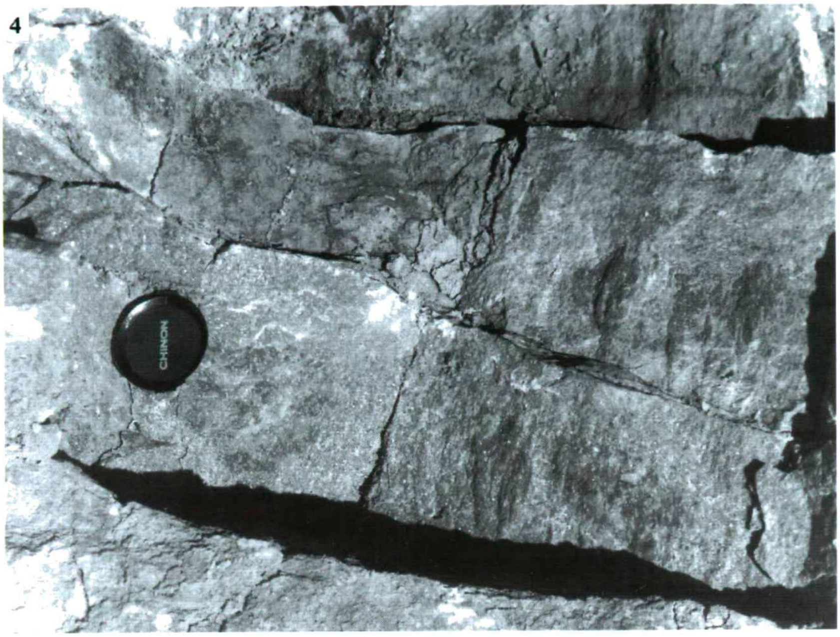

Fig. 4. Crinoidite

Fig. 5. Lithoclastic calcareous marl

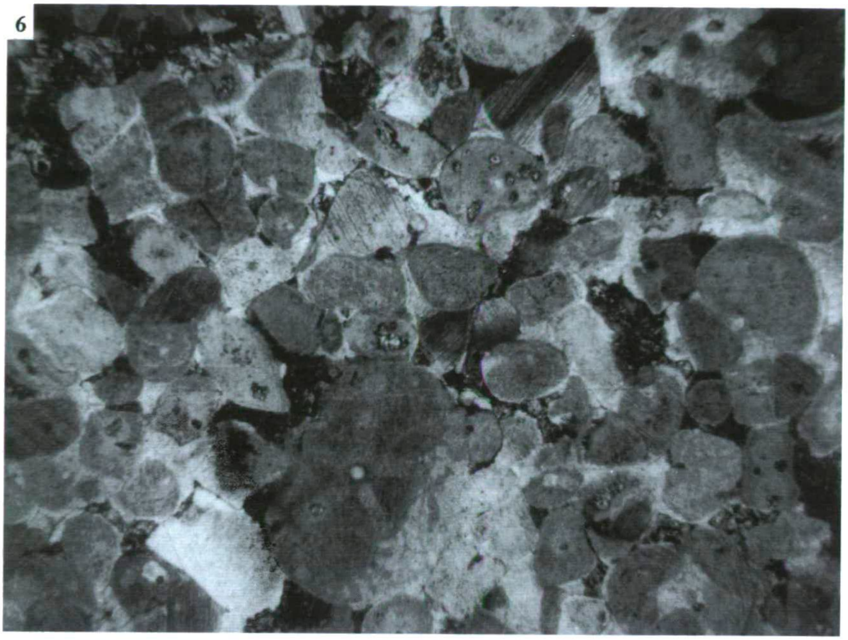

Fig. 6. Echinoderm grainstone

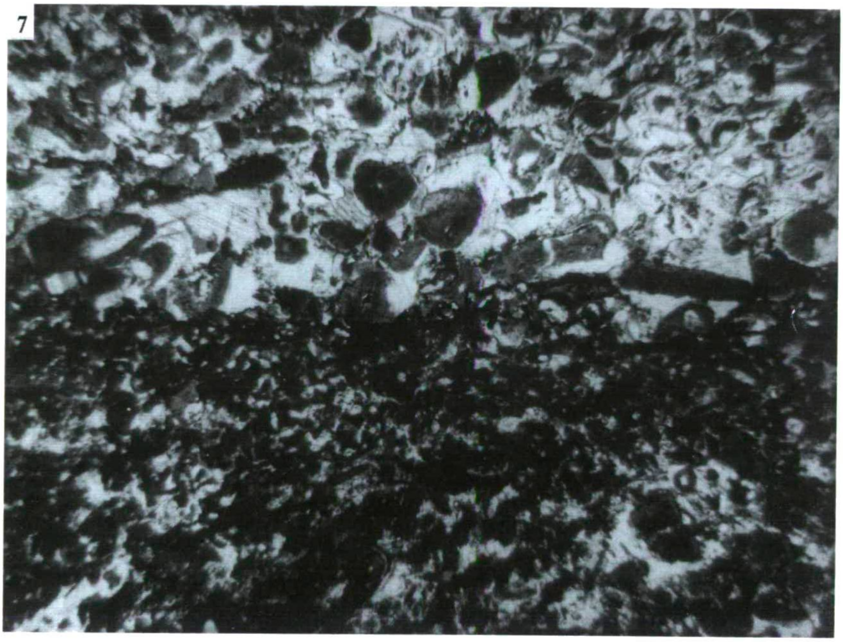

Fig. 7. Allodapic echinoderm grainstone deposited on clayey packstone

more clayey, irregularly elongated or regular lenticular lithoclasts (*Fig. 8*). Texture of the lithoclasts is characterised by echinoderm, but ratio of spicules and bositras considerably increases, too. Radiolarians also appear in the highest layers of the section. It should be noted that unrounded quartz grains of aleuritic size are enriched in laminas of some tenth mm size for some echinoderm packstone samples. Their origin is not certain; role of turbidite flows (Bouma-T_b interval) or that of floor streams can not be excluded, either (SEILACHER 1982).

2) Crinoidal limestone layers are subordinated in this section (layers 35-79). In general, 3-8 cm thick, brown, siliceous nodular, aleuritic limestone, calcareous marl, which contains crinoidal columns and lithoclasts, is characteristic. Greenish grey spongiolite layers appear, and intermediate space of layers becomes to be more thick. Thickness of this section is 4,56 m. (*Fig. 3b*)

Several samples contain echinoderms, although pelagic facies is dominant in its microfacies.

Lithoclastic microfacies described above can also be found in this section. Besides these, echinoderms biomicrite or biosparite of packstone or grainstone texture and foraminifer bositra, spicule biomicrite without sharp boundary are very frequent (*Fig. 9*). Syntaxial cement of echinoderm packstone is substituted by calcedony in several cases. Packstone (rarely wackestone) echinoderm spicule biomicrite (in which bositra and radiolarians are the characteristic accompanying forms) is a frequent microfacies, too (*Fig. 10*). In general, spicules and bositras are oriented; the latter ones form lumachelle-like texture (*Fig. 11*), while the texture shows wackestone character in other parts of same samples, therefore, the rock has a laminated appearance. Echinoderms are well-rounded, terrigenous quartz may occur at most very subordinated amount. The greyish green spongiolite, one of the dominant rock types of the section, appears in this section, too. Its microfacies is a radiolarian spicule biomicrite (*Fig. 12*). Orientation of siliceous spicules can also be observed in this section.

3) This 2,83 m thick section (layers 80-115) started from repeated appearance of red crinoidal limestone (*Fig. 3c*). There is red crinoidal allodapic limestone at its deeper part. Finer grained cherty crinoidal limestone and calcareous marl alternate with greenish cherty marl in the upper part. Dominant rock of the section is greenish grey spongiolite (*Fig. 13*). These rocks also occur in the two lower sections, and characterisation of their microfacies can be found there.

CONCLUSIONS

Microfacies studies on the profile indicate the following environment of formation:

Echinoderm grainstone belongs to the type 12 and zone 6 of the Wilson's standard microfacies zones. This facies occurs in marginal platform environment, near the shallow marine crinoid fields. Biogene elements were transported; medium of high energy, probably above the wave base, washed out the fine micritic calcareous mud from the skeletons, hence, sparry cement could be formed.

According to Wilson, spongiolite belongs to the SMF type 1. It is also suggested by the pelagic planktonic forms. The clayey calcareous mud refers to medium of low energy.

Fig. 8. Echinoderm packstone with lenticular lithoclast

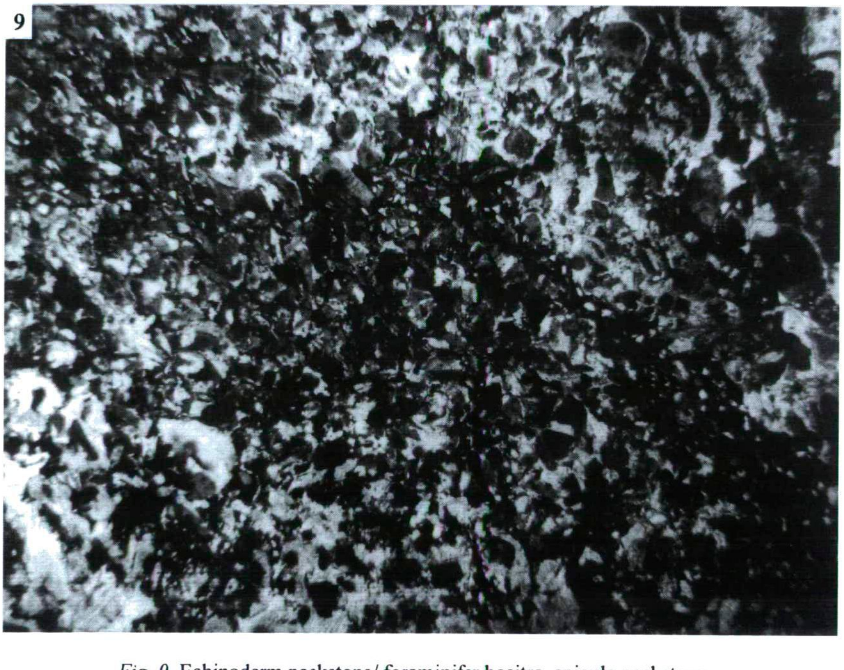

Fig. 9. Echinoderm packstone/ foraminifer bositra, spicule packstone

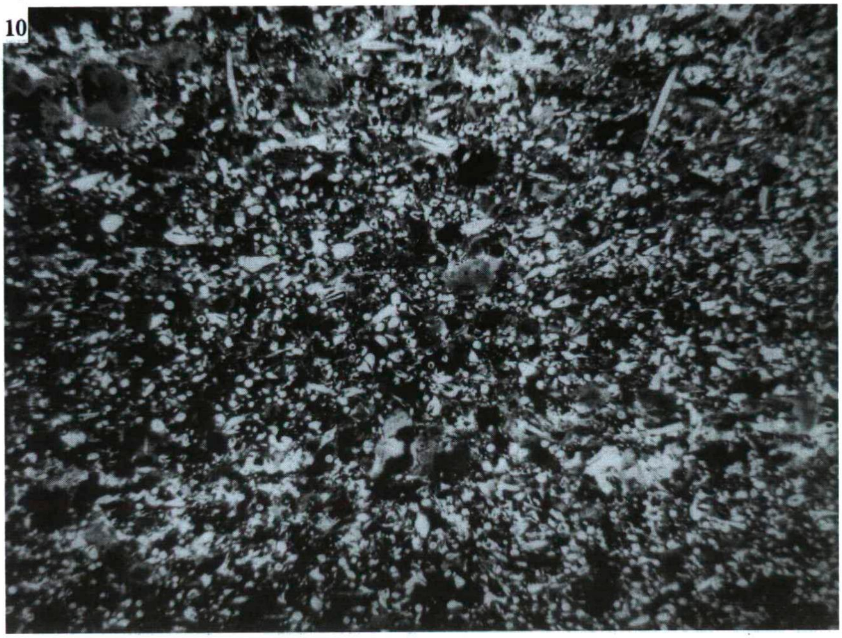

Fig. 10. Spicule biomicrite with bositra, radiolarian and echinoderm

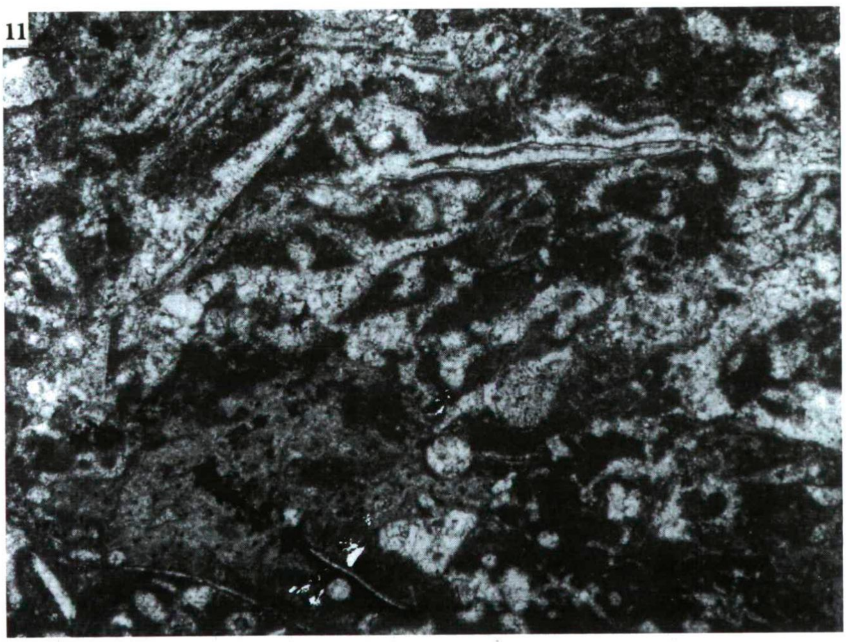

Fig. 11. Lumachelle-like oriented bositras

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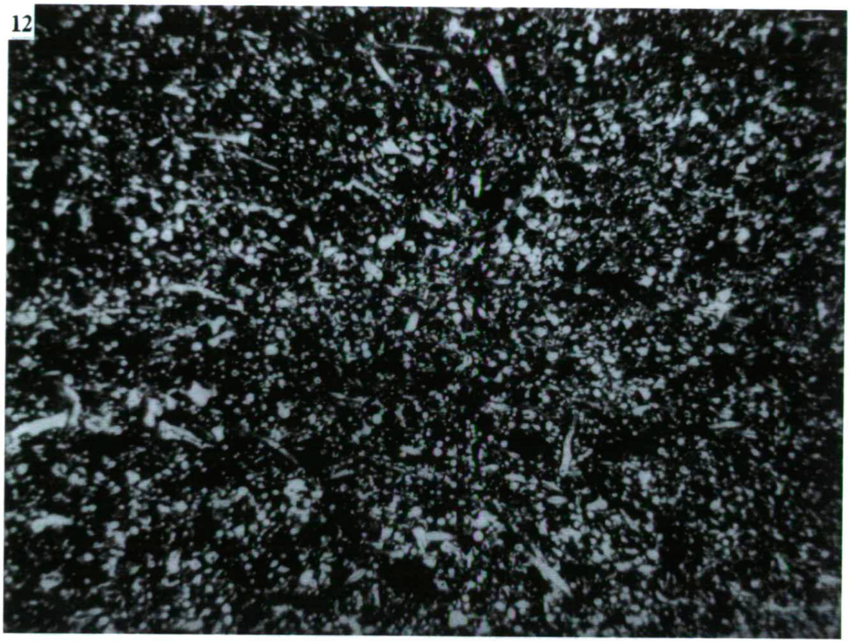

Fig. 12. Spicule biomicrite with radiolarians

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Fig. 13. Spongiolite

The all other microfacies types are classified into the Wilson' SMF type 4 (slope facies). It is sure that the original deposition environment of echinoderm packstone was in a relatively shallow marine and near the biotope of crinoids. Energy of the water low, however, was not sufficient to wash out micritic matrix from the grains. Vicinity of this deposition environment, coarser grainy material moving down the slope either ripped open and included calcareous mud deposited in deeper and more quiet water as intraclasts or deposited on to it with allodapic character and sharp ravinement surface. Part of the crinoid debris rushing down the slope that reached farther appears as an echinoderm-poor microfacies of micritic matrix dominated by pelagic forms.

On the basis of study on the profile it can be stated that it is almost entirely formed by slope facies formations. Presumably, there was a sub-aerial, shallow marine facies (it is shown by terrigenous sand and silt in the material, and, perhaps, by kaolinite occurring generally but in low amount in the clay intercalations) that supported the bioclast material (first of all the crinoid calcarenite) getting the slope. Pelitic sediment characterised by siliceous sponge and pelagic plankton was formed during the periods of rest between the sediment transports.

Two zones can be identified in the profile that could be formed by intensive gravitational transport: at the deeper part of section 1 where calcareous marl and limestone appear above the pure crinoidal limestones, and at the base of section 3 where allodapic limestone can be found. Slope facies is dominant in the other parts of the profile, however, more off-shore, pelitic sediment is also important because of less intensive transport. It can not be excluded that these more intensive periods of the carbonate formations have eustatic reasons, since shelves were drowned during the relative highstands periods. In this way, if other factors do not prevent it, greater amount of biogene carbonate can be formed in the euphotic zone, and can be resedimented to slopes and basin surrounding the platform (SCHLAGER and GINSBURG 1981).

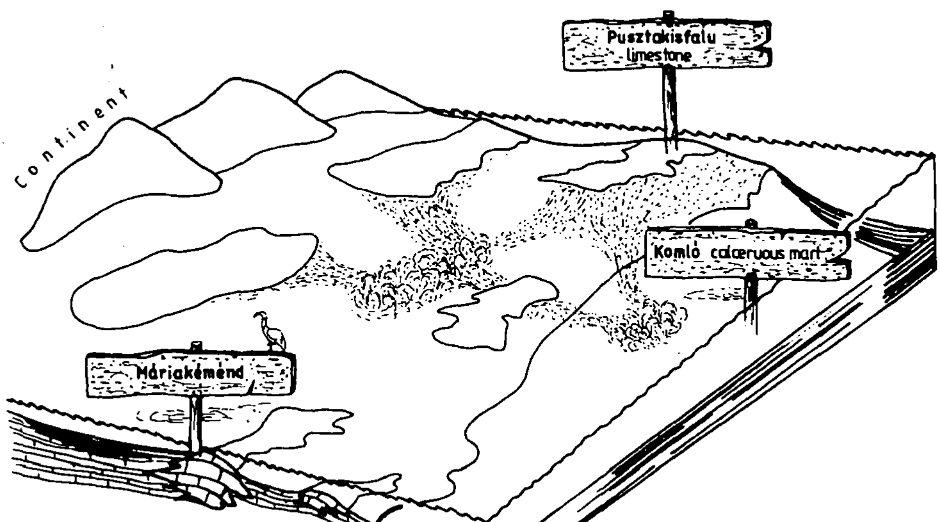

Fig. 14. Facies model of the Jurassic sequence near Máriakéménd village

Study on the surface of the profile confirms Schlemmer's opinion (SCHLEMMER 1984) that the plateau facies Pusztafakisfalu Limestone, the basin facies Komló Calcareous Marl and the intermediate facies between them coexisted for a long time in the Upper Jurassic - Lower Dogger, and interdigitation and closed connection of their formations are characteristic for this period (*Fig. 14*).

Study of the only one reference point, however, does not give an answer the question what connection is between sequence of Mecsek affinity situated on the Máriakéménd-Báta range, which tectonically belongs to the Villány zone, and that of the Mecsek zone of the same age as well as hiatus occurring in the Jurassic sequence of the Villány Mountains.

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REFERENCES

BARABÁS, A. et al. (1964): Results of geophysical research of the Mecsek and Villány Mountains. A Magyar Állami Eötvös Loránd Geofizikai Intézet Évkönyve **I**, 1-126. (in Hungarian)

BARANYAI I. and JÁMBOR Á. (1962): Utilisation of complex geophysical researches and geological studies in the research of the basement in the SE Transdanubian area. Magyar Geofizika. 3, 3-4. 166-176. (in Hungarian)

HETÉNYI R. et al. (1972): Geological map of the Mecsek Mountains. 1: 10000 series. Ófalu. (in Hungarian)

KASZAP A. (1963): Mesozoic island blocks in S Baranya. Földtani Közlöny. **93**, 440-450. (in Hungarian)

KŐRÖSSY L. (1982): Review of geological structure of Hungary. Általános Földtani Szemle. **17**, 21-72. (in Hungarian)

Ifj. LÓCZY L. (1912): Geological condition of southern mountainous area of Baranya County. A Magyar Királyi Földtani Intézet Évi Jelentése. 171-182. (in Hungarian)

Ifj. LÓCZY L. (1915): Monograph of Callovian ammonites of the Villány Mountains. Geologica Hungarica. I. fasc. 3-4. (in Hungarian)

PATAKY N. et al. (1982): Jurassic sequence of the Szén Valley near Ófalu village. Földtani Közlöny. 112, 383-394. (in Hungarian)

SCHLEMMER K. (1984): Microfaciological and sedimentological studies on Jurassic sequence of the boreholes Somberek No. 1 and Máriakéménd No. 3. Manuscript. Department of Petrology and Geochemistry, Eötvös University. (in Hungarian)

SZABÓ J. (1867): Geological notes on the Batina-Bán and the Mohács island. Magyar Királyi Földtani Intézet Évi Jelentése. 336-352. (in Hungarian)

VADÁSZ E. (1935): The Mecsek Mountains. 1-180. (in Hungarian)

VADÁSZ E. (1960): Geology of Hungary. Akadémiai Kiadó, Budapest. (in Hungarian)

WEIN Gy. et al. (1966): Explanation of the geological map series of Hungary. 1:200000 series. L-34-XIII-Pécs. (in Hungarian)

WEIN Gy. (1967): Connections of the orogenic structure zones of SE Transdanubia in the ancient Alpine cycle. Földtani Közlöny. 97, 286-293. (in Hungarian)

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