Features of some Early-Middle Jurassic diastems in Bulgaria

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Abstract. Almost all studied here diastems are situated in the Western Balkanids, and only one is in the Central Forebalkan. They are differentiated in two groups. The first group encloses diastems with cover represented by the deep water micritic limestones of the Yavorrets Formation in which exist more or less shallow-water elements. Some of them are exotic in the low-energy textures (the localities near the town of Belogradchik and by the Ledenika Cave, Vratsa District). The faunal spectra indicate conditions of the deep subtidal - depths about 100-200m. The second group unify diastems created by marine transgressions which were not accompanied by sedimentation. The latter began with delay in the course of deepening of the basin (the localities Desivichki Dol and the village of Mitrovtsi, Montana District, as well as the village of Glozhene, Teteven District and probably the village of Zgorigrad, Vratsa District).

In connection to the different regimes in sedimentation, as a result of marine transgressions and the deepening of the sea-basin, we introduce here some new terms for the different types of sediments. We name syntransgressive sediments those that have accompanied the marine transgressions. They are covered by the postransgressive sediments, deposited with the deepening of the basin. When the marine transgression is not accompanied by sedimentation and the first sediments have been deposited with the deepening of the basin, these sediments are called initial postransgressive sediments. The localities or areas with initial postransgressive sedimentation possessed a positive relief and resulted in formation of diastems. Their basements always are older than the Jurassic and usually are covered by hardgrounds. The significance of such type of diastems is bigger than has been regarded in the past.

V. Belivanova, I. Sapunov - Особенности некоторых ранне-среднепермских диастем в Болгарии. Почти все описанные диастемы установлены в Западных Балках, в тех участках позитивного рельефа, на которых не происходило накопления синтрансгрессивных отложений, а образовались диастемы. Эти породы развиты на докорсских хардграундах (на твердом дне). По всей вероятности этот тип диастем имеет большее значение, чем то, которое им отводилось до сих пор.

**Key words:** Early-Middle Jurassic, diastems, microfacies, palaeoecology, Balkanids, Bulgaria.

1. Introduction

In a recently published work (Belivanova, Sapunov, 2003) on the Central Balkanids we described and interpreted the most considerable Early-Middle Jurassic stratigraphic gap in this country — the pre-Callovian gap. This area was selected because there this gap is well outcropped and traceable. We applied a joint study of microfacies analysis palaeoecological investigation of faunal spectra in the cover of the basement (in condition of non-deposition) of the gap. It was established that in its central part the gap is with a maximum duration as a result of more or less intensive submarine washout. To the west and east of its central area, the pre-Callovian gap shortened its duration because of the gradual change from regime of non-deposition. In the same paper, our point of views about the basic terms connected with the object of the stratigraphic gaps was formulated and defined. In the present paper we use the same terminology.

Apart the above-mentioned data of the origin of the pre-Callovian stratigraphic gap in the Central Balkanids, we established that outside of this area submarine gaps were realized by different conditions. In the older literature most of these Early-Middle Jurassic gaps have been connected with local regressions, emergence, denudations and new transgressions (CrecepaHob, Bpo6JI5IHCKJ1 in UaHKOB et. al., 1960; CrecepaHob, 1961 and others).

The studied ammonites are kept in the Museum of Paleontology and Historical Geology of the University of Sofia. The samples and the thin sections object of the present microfacies analysis are kept in the Geological Institute of the Bulgarian Academy of Sciences — SR. 1, 2003. 2. 1-10.

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2. Pre-Callovian diastems

with micritic limestone cover that contains shallow water elements

2.1. Diastem near the town of Belogradchik

This small diastem is situated on the road Belogradchik — Oreshets Railway Station (Fig. 1). An excellent description of its Lower Bathonian basement and Lower Callovian cover and their ammonites (described and figured) has been made by Степанов (1961). Other publications on this object were made by Бончев, Попов (1935), Атанасов, Стоянов (1956) and Степанов, Врблянски in Цанков et al. (1960).

2.1.1. Diastem cover

According to the description by Степанов (1961) it is represented by 0,3 m thick brown-red micritic limestones (packet 7). Below follow yellowish-red 0,15 m thick micritic limestones (packet 6). All they contain iron hydroxide ooids. In packet 6 large flat-spherical ferrous hydroxide nodules exist. The so described 0,45 m thick micritic limestones belong to the Yavorets Formation. The following taxa have been found: Macrocephalites macrocephalus...
(Schlotheim, 1813) (Lower Callovian), Hectoroceras (H.) hecticum (Reinecke, 1818) (Callovian, mainly, Lower Callovian) (rare), Cho-ffaita spirorbilis (Bonchev & Popov, 1935) (Lower Callovian) (rare). They are accompanied by different Perisphinctidae, representatives of Phylloceratina, single Lytoceratina and single brachiopods, belemnites and bivalves.

Biostratigraphic results. The above cited ammonite association prove that the lowermost 45 cm of the Yavorets Formation belong to the Lower Callovian.

Results of the microfacies study and analysis of the faunal spectra. One microfacies type has been distinguished in the Yavorets Formation about 10-15 cm from its lower boundary (sample 2): wackestone with filaments of thin-shelled bivalves. Mud supported texture with abundant bivalve filaments which are presented in amount about 30% (0.01 mm thick) as well as single crinoid fragments are typical for these sediments. Single grains of authigenic glauconite (about 0.04 mm) and quartz can be observed, too. This texture was formed in low-energy bottom environment. The presence of big ooids intensively stained with iron-hydroxides is an exotic element for this low-energy texture. They have concentric laminae and size which vary from 0.2 mm to 1.2 mm. Ellipsoidal shape of ooids is characteristic when they are with good preservation. However, they are frequently worn, broken or present only single sharp angular fragments. Intensive coloration with iron-hydroxides is typical only of ooids but not for the main rock. All these features show that the ooids were formed in different shallow-water, high-energy and high oxidizing environment and later were transported in quite deep water environment. This microfacies is correlated with SMF Type 3 — pelagic wackestone. It is interpreted as formed in subtidal or bathyal environment (Flügel, 1982) (pl. I, fig. 1).

In the faunal spectrum the ammonites explicitly predominate. Ammonitina repeatedly exceeded Phylloceratina. Single Lytoceratina present. The ammonites are accompanied by single brachiopods, belemnites and very rare bivalves. This spectrum belongs to the fourth group according to the accepted by Belivanova, Sapunov (2003) classification. It indicates the deepest deep subtidal conditions — depths near 200 m.

2.1.2. Diastem basement

According to the description by Стефанов (1961) it is represented by 0.3 m rusty yellow sandy, bioclastic limestones with quartz grains (packet 5) and below 0.45 m grey sandy bioclastic limestones with quartz grains (packet 4). All this 0.75 m thick limestones belong to the topmost part of the Polaten Formation.

In both packets the following Lower Bathonian ammonite species have been found:

from packet 5 —

O p p e l l i a (O x y c e r i t e s ) seebachi W etzel, 1950 (upper part of the Zigzagiceras zigzag Zone), O. (O.) fallax (Guéranger, 1865) (middle and upper part of the Z. zigzag Zone) (it is found also in packet 5), O. (O.) postera (Wetzel, 1950) (middle and upper part of the Z. zigzag Zone) it is found also in packet 5), Procerites fullonica (Buckman, 1922) (upper part of the Z. zigzag Zone), Ebrayiceras pseudoaengae (Ebray, 1864) (middle part of the Z. zigzag Zone).

Biostratigraphic results. We correlate the middle part of the Zigzagiceras zigzag Zone near Belogradchik with the Morphoceras macrescens subzone of the Z. zigzag Zone in the Subboreal Province. The upper part of the Z. zigzag Zone near Belogradchik is correlated with the Oxycerites yeovillensis Subzone of the Z. zigzag Zone in the Subboreal Province (Mangold, Riout, 1997, p. 56, 57). The lower part of the Z. zigzag Zone (= Parkinsonia (Gonolkites) convergens Subzone) is not represented near Belogradchik.

Results of the microfacies study and analysis of the faunal spectra. From the upper part of the Polaten Formation (about 40-50 cm below the boundary with the Yavorets Fm.) one microfacies type has been distinguished: bioclastic/lithoclastic wackestone/packstone (sample 1). The texture is grain-supported with transition to mud-supported. It is built up of about 50% grains which are included in recrystallized calcite spar but relics of micrinite are observed, too. The allochons are crinoids (0.6-0.9 mm), brachiopods (up to 1.2 mm), echinoids (about 0.6 mm), foraminifers (0.2-0.3 mm), bivalves and lithoclasts (0.3-1.4 mm). Single lithoclasts and single bivalves are more than 2 mm in size. Around some lithoclasts thin oncoide envelopes have been observed. In most cases they are...
abraded and broken. It may be assumed that this allochems probably were transported from different environments were the oncoids have been formed. Terrigenous quartz (10-20 %) is represented from monocrystal as well as from policrystal aggregates. To some extent, this microfacies could be correlated with SMF Type 4. Its formation could be related to shallower parts of the subtidal environments (pl. I, fig. 2).

In the faunal spectrum the ammonites predominate. They belong to Ammonitina. In the middle part of the Z. zigzag Zone they are accompanied by many brachiopods, few bivalves and single gastropods. In the upper part of the Z. zigzag Zone the brachiopods quickly decrease. The faunal spectrum from the upper part of the Z. zigzag Zone belongs to the third group according to the accepted by Belivanova, Sapunov (2003) scheme. It is connected with the upper part of the deep subtidal — depths 100-150 m.

2.2. Diastem by the Ledenika Cave, near the town of Vratsa

The studied locality is situated on the road between Vratsa and the Ledenika Cave (Fig. 1). It was described by Начев et al. (1962).

2.2.1. Diastem cover

It is represented by the dark-grey micritic limestones of the Yavorets Formation. In its very base, Macrocephalites macrocephalus (Schloetheim) (Lower Callovian), M. paronai Basse & Perodon (Lower Callovian) and Choffatia sp. indet. (Upper Bathonian — Middle Callovian) are found (Fig. 2).

Biostratigraphic results. The above cited species of Macrocephalites prove that the very base of the Yavorets Formation belongs to the Lower Callovian.

Results of the microfacies study and analysis of the faunal spectra. One microfacies type has been distinguished in the Yavorets Formation about 10 cm above its lower boundary (sample 6): peloidal-bioclastic packstone/grainstone. The texture is grain supported. It is built up of small allochems predominately represented by peloids (0,05-0,07 mm) and some bioclasts (bivalves, crinoids), single ooids (0,14-0,2 mm), single intraclasts (0,3-0,8 mm). The small size of the fragments is very characteristic. They are cemented with very fine-grained to fine-grained calcite spar, but the presence of micrite in places is considerable. The texture is moderately sorted. Although the ooids and cortoids are considered as a shallow-water elements their presence to the depths about 100 m is accepted (Flugel, 1982). To some extent this microfacies type could be correlated with SMF Type 2 — microbioclastic calcsiltite (pl. I, fig. 3).

The single ammonites from Ammonitina found in the very base of the Yavorets Formation indicate that the bathymetric conditions are connected with the shallow part of the deep sublittoral — depths — 100-150 m (the faunal spectrum probably belongs to the third group according to Belivanova, Sapunov, 2003).

2.2.2. Diastem basement

It is built up of the grey, sandy, bioclastic limestones of the Polaten Formation. In this locality macrofossils haven't been found (Fig. 2).

Results of the microfacial study. From the upper part of the Polaten Formation (about 15 cm below the boundary with the Yavorets Formation), recrystallized fine-grained limestone (probably bioclastic wackestone/packstone) have been described (sample 7). The texture is built up mainly of calcite pseudospar (about 0,02 mm) but relicts of micrite have been observed, too. Allochems are predominately of crinoids (20-22 %), rare echinoids and irregularly presented filaments of thin-shelled bivalves as well as normal bivalve fragments. About 10 % grains of terrigenous quartz (0,06-0,5 mm) and 5-10 % grains of authigenic glauconite (0,1-0,3 mm) are presented, too. Because of the intensive recrystallization the correct microfacies characteristic of this texture is not possible.
Early and Middle Jurassic diastems, result of marine transgressions not attended by sedimentation

Usually the marine transgressions are accompanied by sedimentation. Such sediments are named transgressive sediments (Зоненгейм, 1979, p. 348). These sediments often are terrigenous, clastic and are deposited in very shallow marine conditions — in the shallow sublittoral, at depths between 0 and 50 m. The faunal spectra in the transgressive sediments consist of benthic representatives, very often as fragments, because of the high energy conditions. We believe that it would be more correct and appropriate to use the term “syntransgressive sediments” instead of “transgressive sediments”, because these sediments themselves cannot be transgressive. They only are deposited during the transgression. Therefore, the use of the syllable “syn” before “transgressive” has its sense, dividing transgression from sedimentation. Thus, we propose here the term syntransgressive sediments and syntransgressive sedimentation. Later on, with the deepening of the basin, the deposition of deeper-sea sediments begins. We name here such sediments posttransgressive sediments, hence, posttransgressive sedimentation.

Sometimes in limited localities or areas marine transgressions existed that were not accompanied by sedimentation. Usually this is proved by the presence of hardgrounds over the upper surface of the basement which existed before the marine transgression. Above such basement directly lie more or less deeper sediments (in comparison with the syntransgressive sediments) which in fact are posttransgressive sediments. For such posttransgressive sediments, that are the first sediments after the marine transgression, we propose here the new term initial posttransgressive sediments, hence, initial postransgressive sedimentation. Initial postransgressive sedimentation exists in localities or areas with positive relief. The syntransgressive sedimentation exists in the neighbour localities or areas with negative relief, which usually surround the submarine heights.

Below we describe several Bulgarian examples for diastems, formed as a result of initial postransgressive sedimentation.

3.1. Pre-Bathonian and pre-Callovian diastems in the localities Desivichki Dol and the village of Mitrovtsi, Montana District, West Forebalkan

In these two localities are visible diastems, result of initial postransgressive sedimentation (Fig. 1).
3.1.1. Callovian cover of the diastems

The very base of the cover is represented by the micritic limestones of the Yavorets Formation (Fig. 3).

According to data of Стефанов, Връблянски и Цанков et al. (1960), Stephanov (1966) and Стефанов, Цанков (1970) the following ammonite taxa have been found: *Macrocephalites macrocephalus* (Schlotheim) (Lower Callovian), *Hecticoceras (Chanasia) hartmanni* Zeiss (Callovian), *Grossouvrinia spp.* (Callovian), *Oecotraustes (Thraxites) davitashvili* Stephanov (Lower Callovian) and many others. They are accompanied by representatives of Phylloceratina and single *Lythoceratina*.

**Biostratigraphic results.** The presence of *Macrocephalites macrocephalus* and *Oecotraustes (Thraxites) davitashvili* prove that the lowermost part of the Yavorets Formation belongs to the Lower Callovian.

**Results of the microfacies study and analysis of the faunal spectra.** Two microfacies types have been established in the Yavorets Formation about 15-20 cm above its lower boundary in the Desivichki Dol section (sample 4) and about 10-15 cm above the lower boundary in the Mitrovtsi section (sample 5): wackestone with filaments of thin-shelled bivalves and bioclastic wackestone/packstone with abundant bivalves.

Wackestone with filaments of thin-shelled bivalves (sample 4) are very similar to the same microfacies type which was described in the section Belogradchik. Mud supported texture with abundant filaments of thin-shelled bivalves (30-40 %) is typical. The thickness of the shells is about 0,01 mm and rarely 0,02 mm. Single crinoid fragments as well as single glauconite grains (about 0,2mm) can be observed too. The described non-washed texture is connected with low-energy bottom environment. This microfacies type is correlated with SMF Type 3 — pelagic wackestone (pl. II, fig. 1).

Mud support with transition to grain support is typical for the bioclastic wackestone/packstone with abundant bivalves (sample 5). The allochems are represented predominantly of bivalves and some gastropods, crinoids and foraminifers. Single large bivalve fragments can be observed, too. The texture is poorly or moderately sorted with non-rounded allochems. The established faunal association is characteristic for the open marine shelf. This microfacies type to some extent could be correlated with SMF Type 9 — bioclastic wackestone. This SMF type is formed in shallow neritic water with open circulation (corresponding to Wilson’s Facies Belt 7), or just below the wave base (Facies Belt 2, open marine shelf). Another location of the depositional environment seems to be submarine swells within the subtidal or bathyal shelf (Flügel, 1982) (pl. II, fig. 3).

The ammonites prevale over the other faunas in the spectrum. Ammonitina predominate Phylloceratina. *Lytoceratina* is present with single specimens. So defined, this spectrum belongs to the fourth group according to Belivanova, Sapunov (2003). The depths were near 200 m.

3.1.2. Bathonian basement (and cover) and Triassic basement of the diastems

The Bathonian basement (and cover) is represented by grey, sandy, bioclastic limestones, very rich of ammonites. It is very thin — about 0,6 m and belongs to the Desivichki Dol Marker (in the framework of the Polaten Formation). On the one hand, the Desivich Marker is basement of small diastem, covered by the Lower Callovian micritic limestones in the western part of the Desivichki Dol locality. On the other, the Marker is the cover of another diastem, whose basement is represented by Upper Triassic limestones. Their upper surface is covered by a remarkable hardground. In the eastern part of the locality Desivichki Dol as well as in the locality Mitrovtsi only one diastem exist that embraces a remarkable geochronologic interval limited from the Late Triassic to the Late Bathonian (Fig. 3).

According to data of Стефанов (1963) and Stephanov (1966, 1972) in the Desivichki Dol Marker (Desivichki Dol locality) are found the following ammonite species: *Cadomites zlatarskii* Stephanov, 1963 (Middle Bathonian, *Tulites subcontractus* Zone), *Bullatemorphites bullatus* (d’Orbigny, 1846) (Middle Bathonian, *T. subcon-
Fig. 3. The diastems by Desivichki Dol and the village of Mitrovtsi with the neighbour localities, Montana District 1 — stratigraphic gap result of emersion; 2 — submarine stratigraphic gap; 3 — transgressive boundary; 4 — boundary of submarine stratigraphic gap; 5 — hardgrounds; 6 — numbers of samples for microfacial study; Verenitsa Member of Bov Formation — clayey limestones intercalated with marls; Yavorets Formation — micritic limestones; Polaten Formation — sandy, bioclastic limestones; Desivich Oolite Marker — sandy, bioclastic limestones, very rich on ammonites; Kichera Formation — sandstones, gravelstones and conglomerates.

### Biostratigraphic Results


### Results of the microfacies study and analysis of the faunal spectra

From the Desivich Oolite Marker in the Desivichki Dol section (about 10-15 cm below the boundary with the Yavorets Formation) sandy recrystallized finegrained limestones have been described (sample 3). The texture is built up predominantly of calcite spar but in places relics of micrite can be observed. Allochems are represented mainly of oncoids (25%), crinoids up to 15% and some echinoids, brachiopods and foraminifers. Terrigenous quartz is presented with amounts of 10-15% (0.18-0.3 mm). The oncoids are irregularly rep-

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**PLATE II**


Scale bar = 0.3 mm

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resented in this texture. Their sizes vary from 0.18 mm to 1 mm in diameter (more often from 0.4 to 0.6 mm). The shape of the oncoids depends mainly on the nucleus and it is mainly ovooidal or irregular (normal oncoids). Lithoclastic fragments as well as former oncoids serve as nuclei of the oncoids. Sometimes the oncoids are composite with more than one nucleus (quartz grain and former oncoid; three former oncoids). Their coatings consist of fine alternating laminae from clear sparry calcite and micrite (the latter predominate). They are asymmetric, irregular or wavy. The oncoids often are broken, abraded and with broken lamellae probably as a result of the transport. They are intensively stained by iron-hydroxides but the pigmentation is not typical for the main rock. It may be assumed that these fragments have an allochtonous origin and were formed in different shallower-water and high oxidizing environment. Because of the intensive recrystallization, the correct microfacies characteristic of this texture is not possible (pl. II, fig. 2).

The faunal spectrum in the Desivich Oolite Marker is represented mainly by ammonites. Few benthic representatives take part in the spectrum. The last belongs to the third group according to the scheme of Belivanova, Sapunov (2003). It indicates depths of about 100-150 m, i.e. the shallow part of the deep subtidal.

The Upper Triassic limestones of the basement are covered by a remarkable hardground.

3.1.3. Conclusions

The syntransgressive terrigenous clastic sediments (Kichera Formation) deposited in the neighborhood localities belong to the upper part of the Aalenian (Fig. 3). This gives us grounds to consider that the marine transgression in the localities studied was realized during the late half of the Aalenian.

3.2. Pre-topmost Hettangian-Lower Sinemurian diastem by the village of Glozhene, Teteven District

A diastem of a very short duration exists near the village of Glozhene. It was a result of initial posttransgressive sedimentation (Fig. 1).

3.2.1. Diastem cover

It is represented by grey-pink, bioclastic limestones with chlorite and goethite ooids. They are only 0.45 m thick and belong to the Ozirovo Formation (Fig. 4).


**Biostratigraphic results.** The single species known from the Hettangian is *Paralleloodon hettangiensis*. All species of *Cardinia* as well as *Lobothyris gretensensis* and *Spiriferina walcotti* range from Hettangian to Lower Sinemurian. Important are Sinemurian species, or species with first appearance in the Sinemurian — such as *Gryphaea arculata*, *G. cimbium*, and *Pleuromya elongata*. We can draw the conclusion that this lowest 0.45 m thick bed of the Ozirovo Formation belongs to the highest levels of the Hettangian and mainly, to the Lower Sinemurian. These two units probably are partly condensed in the lowest levels of the bed.

**Results of the microfacies study and analysis of the faunal spectra.** One microfacies type has been distinguished from the basement of the Ozirovo Formation in the section Glozhene (sample 10): rudstone with coarse lithoclasts and bioclasts. Under the microscope it resembles to carbonate breccia (microbreccia). Grain supported texture with more than 50 % of allochems being mainly coarse lithoclasts (more than 10 % of particles are greater than 2 mm) and bioclasts was described. The size of the lithoclasts vary from 5 mm to 25 mm. The bioclasts are represented by bivalve, brachiopod and bryozoan (about 5 mm) fragments. Several microfacies types may be recognized in the clasts: red bioclastic wackestones (bivalves, brachiopods, echinoids); grainstones with ooids and oncoids (0.4-0.6 mm) which are intensive stained by iron-hydroxides; fossiliferous micrite and calcisiltite. The matrix is sparse. This microfacies type can be attributed somewhat to the SMF Type 24, corresponding to Wilson's Fa­cies Belt 8 (restricted platform).
The topmost Hettangian-Lower Sinemurian faunal spectrum is represented by benthic groups — bivalves and brachiopods. Many of the specimens are fragmented. This gives us grounds to make the conclusion that the bathymetric conditions in the studied locality are in the framework of the shallow subtidal — depths from 10 to 50 m. This faunal spectrum belongs to the first group according to the accepted by Belivanova, Sapunov (2003) scheme.

3.2.2. Diastem basement

It is represented by Middle Triassic limestones. Their upper surface is covered by hardground (Fig. 4).

3.2.3. Conclusions

The studied initial posttransgressive sediments from the cover of the pre-topmost Hettangian-Lower Sinemurian diastem prove that this diastem existed in very shallow-water conditions. When correlated with the Hettangian terrigenous, clastic syntransgressive sediments (Kostina Formation) by the town of Teteven, we consider, that in the locality Glozhene the marine transgression without syntransgressive sedimentation began during the end of the Hettangian (Fig. 4).

3.3. Notes on the so-called Callovian to the south-east of the village of Zgorigrad, Vratsa District

Six kilometers south-east from the locality Ledenika an almost vertical cliff exists built up by grey micritic limestones (Fig. 1, 2). They overlie above Triassic limestones which are not included in the cliff and form a sloping relief below the cliff. Without evidence Haven et al. (1962) believed that the lowest levels of these micritic limestones belonged to the Callovian. The same was also believed for the micritic limestones which again lie above the Triassic limestones in the locality Vratsata (about 1,5 km south-east from the locality Ledenika. Later, Sapunov in Nikolov, Sapunov (1977) proved that the limestones in question are Tithonian and belong to the Glozhene Formation. All the limestones of these three localities are micritic, but under the microscope have quite different characteristics. Especially the so-called Callovian limestones near Zgorigrad are slightly recrystallized almost pure micritic limestones (more details about their microfacies characteristics are given below). Such limestones are typical for higher levels of the Yavorits Formation and are not Callovian in age. More probably they belong to the Oxfordian. In any case the problem with their age remains open and need further studies.

Fig. 4. The pre-topmost Hettangian-Lower Sinemurian by the village of Glozhene correlated with the Hettangian-Sinemurian sequence by the town of Teteven, Central Forebalkan
1 — stratigraphic gap result of emersion; 2 — submarine stratigraphic gap; 3 — transgressive boundary; 4 — boundaries of submarine stratigraphic gap; 5 — hardgrounds; 6 — micritic limestones; 7 — number of sample for microfacial study; Kostina Formation sandstones, gravelstones and conglomerates; Ozirovo Formation — sandy, bioclastic limestones
Results of the microfacies study. Two samples have been analyzed from the Yavorets Formation in the Zgorigrad section — one from the very base of the Formation (sample 8) and one from about 10 cm above its lower boundary (sample 9). Their textures are built up of homogeneous slightly recrystallized very fine-grained (0.01 mm) to fine-grained (0.03-0.05 mm) calcite micropar. Only single indeterminable allochems or single crinoids (0.4 mm) and bivalves (up to 2 mm) can be observed. Although the microfacies characteristic of this recrystallized texture would be speculative, to some extent conditionally it could be correlated with SMF Type 2 — pelagic mudstone.

Conclusions. The examined locality is situated in the Zgorigrad Step of the Vratsa Early-Middle Jurassic Complex Horst (Cantúrov et al. 1988, p. 46, fig. 23). It seems that marine transgression covered the Step before the Callovian, probably during the Bathonian or even earlier. We believe that these Oxfordian limestones, which lie above Triassic calcareous rocks, are probably initial posttransgressive sediments.

4. Conclusions

(1) The cover of some pre-Callovian diastems is represented by micritic limestones that contain more or less shallow water elements. Usually they are exotic for the low energy textures of these limestones. The faunal spectra indicate that the respective limestones were deposited in the deep subtidal.

(2) Some diastems are a result of marine transgressions without sedimentation. They embrace different in duration geochronologic intervals — from 1-2 Ma to 12 Ma. The cover of such diastems is represented by more or less deep sediments, deeper in comparison to the sediments that accompanied the marine transgression. Their basement is always older than the Jurassic, and their upper surface is usually covered with hardgrounds.

(3) Here we introduce new terms for some different kind of sediments, respectively sedimentation, in relation to the marine transgressions and deepening of the sea basin. For the sediments which accompanied the marine transgressions we propose the term syntransgressive sediments and syntransgressive sedimentation. For sediments which are deposited after the syntransgressive sediments in conditions of deepening of the sea basin, we introduce the term posttransgressive sediments and posttransgressive sedimentation. In the cases when posttransgressive sediments are covering diastems, that are formed as a result of marine transgression without sedimentation, we propose the term initial posttransgressive sediments and initial posttransgressive sedimentation. Such sedimentation was realized in limited localities and areas with positive submarine relief.

(4) The initial posttransgressive sediments have a broad distribution in the Lower and Middle Jurassic sequences in this country. The significance of such type of diastems is bigger than it has been admitted in the past. We believe that they are with important meaning.

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