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Are there any Dachstein Limestone fragment in the Felsővadács Breccias Member?

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Van egyáltalán Dachsteini Mészkő a Felsővadácsi Breccsában?

Összefoglalás

Megállapítást nyert, hogy a korábbi véleményekkel szemben a Felsővadácsi Breccsának nem fő alkotója a Dachsteini Mészkő, sőt elő sem fordul benne. Az annak vélt anyag platformi eredetű felső-jura mészkő.

Introduction

The Felsővadács Breccia Member of the Bersek Marl Formation of Berriasian age is a product of a rapid change in the sedimentary environment within certain parts of the Alpine–Carpathian realm; this rapid change occured due an alteration of the tectonic style. In Hungary it is restricted to the Gerecse Mountains (*Figure 1*), where the pelagic limestone of the Jurassic was replaced by the siliciclastic sedimentation at the beginning of the Cretaceous. The phenomenon resembles the Barmstein Limestone in the Northern Calcareous Alps and also the Nozdrovice (Faupl et al. 1997) and the Walentowo Breccias (Krobicki & Slomka 1999) in the Western Carpathians. This prevailing rock type is the major difference among them so far, because the latter ones composed of Jurassic rocks (mainly limestones) while the Felsővadács Breccia — according to the literature — comprises rock fragments 75% of which are Dachstein Limestone, and the rest is Jurassic radiolarite and basic volcanic materials.

Short history of the process of recognition

The Felsővadács Breccia was discovered by Hofmann (1884) in the Paprét Ravine (*Figure 2*). He characterised it as a “sandy, greenish glaukonitic, breccia-like limestone bank” .

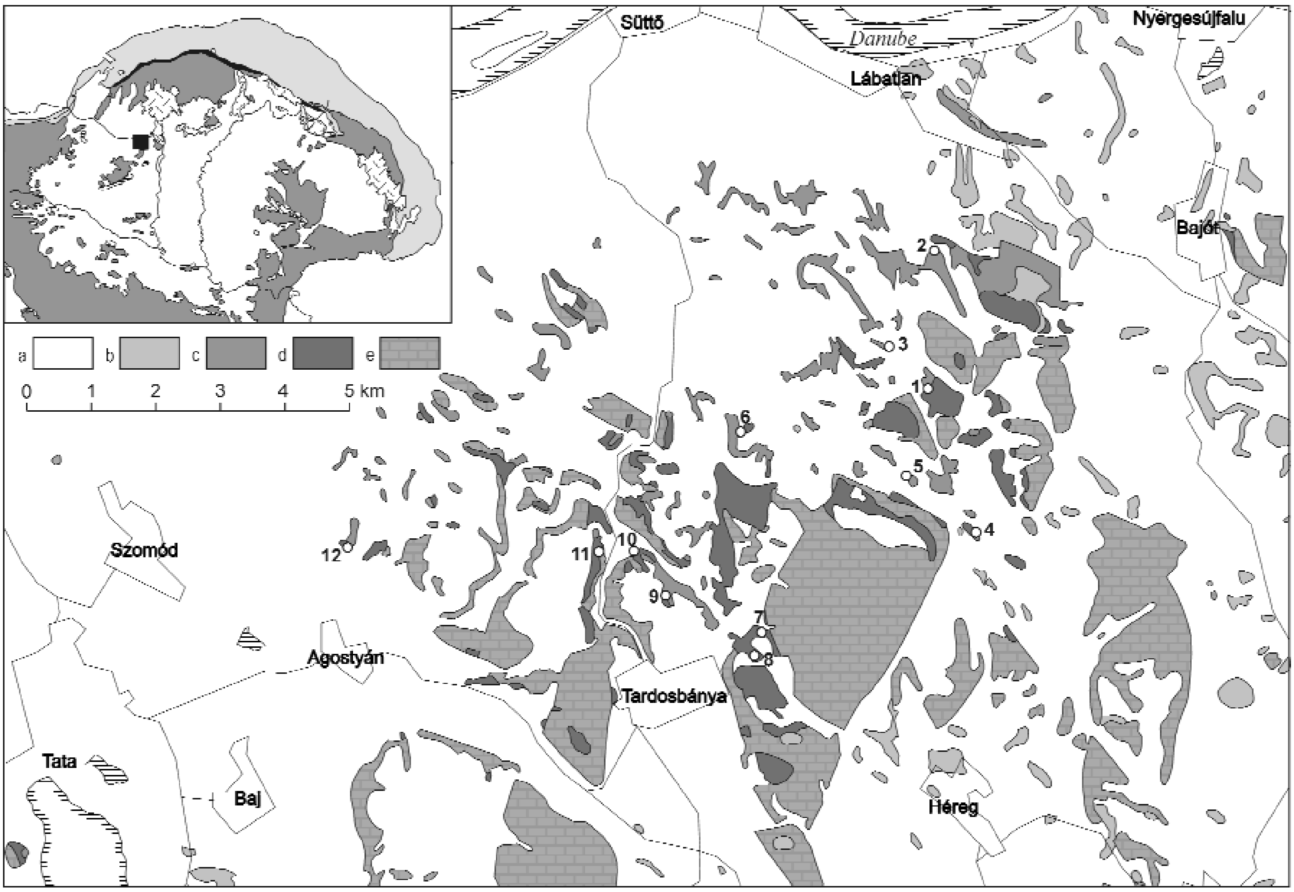

Figure 1. Location and simplified geological map of the Gercse Mountains (after Gyalog & Síkhegyi 2005 modified)
Legend: a = Neogene and Quaternary, b = Palaeogene, c = Lower Cretaceous, d = Jurassic, e = Upper Triassic, 1 -Törökbükk, 2 -Póckő, 3 – Margit-tető, 4 – Pusztamarót, 5 – Nagy-Pisznice S, 6 – Paprét Ravine, 7 – Bagoly Hill S, 8 – Bánya Hill N, 9 – Szél Hill S, 10 – Szél Hill N, 11 – Alsó-Látó Hill, 12 – Tűzkő Hill

1. ábra. A Gerecse helyszínrajzi és egyszerűsített földtani térképe (Gyalog & Síkhegyi 2005 után, módosítva)

Figure 2. Upper Jurassic formations (lower half) and Felsővadács Breccia banks (upper half of the picture) in a surface outcrop, Paprét Ravine, Süttő

2. ábra. *Felső-jura képződmények és a Felsővadácsi Breccsa padjai a süttői Paprét-árokban*

Forthermore, on the basis of the ammonites he dated it as Berriasian. According to FÜLÖP (1958) the Dachstein Limestone is the predominant rock type of the breccia but basalts (i.e. the „diabase”) and radiolarite fragments are also typical constituents whereas dolomite and Jurassic limestone clasts are very scarce. The only fossil he mentioned as evidence for the Triassic age of the limestone fragments is *Triasina* sp., although he listed the types of Dachstein Limestone as follows: foraminiferal, ooidic and coral-bearing ones. The base of the formation is sand and sandstone consisting of the same type of rocks as the breccia does (FÜLÖP 1958). Its fossil assemblage is composed of belemnites, ostreid bivalves, *Milleporidium* sp. and *Leptophyllia* cf *recta*. Accordingly, he interpreted the Felsővadács Breccia as being of littoral and sublittoral origin. FÜLÖP (1958) assumed that a nearby zone of land covering a large area was the source region for the Dachstein Limestone clasts whilst the volcanites and radiolarites came from a more distant place. The spatial extent of the Felsővadács Breccia was outlined by CSÁSZÁR (1995), who also emphasized that its formation represents an isochrone event due to the fact that the breccia cuts facies boundaries represented by the Szentivánhegy Limestone and the Bersek Marl Formations. Its thinnest (10 cm) occurrence is found within the Szentivánhegy Limestone at Szomód to the west; its thickest occurence (2.3 m – with a Holocene cover) is east of the Nagy-Pisznice Hill close to the base of the Bersek Marl. According to B. ÁRGYELÁN & CSÁSZÁR (1998) the source area was located along the Hurbanovo tectonic line. At some time this was an island arc system, consisting of obducted oceanic basement rock types and platform carbonates at the same time. The occurrence of *Clypeina jurassica* [now *C. sulcata* (ALTH.)] in the matrix of the breccia formation indicates a nearby carbonate platform in the Late Jurassic and Early Cretaceous (CSÁSZÁR et al. 1998). New outcrops of breccia formation were proved by FODOR & LANTOS (1998). BÁRÁNY (2004) summarized the knowledge gathered about the Felsővadács Breccia. Based on sedimentological investigation on polished rock surfaces from different outcrops PETRIK (2008) proved the existence of an olistosinagma type debris-flow sedimentation. During the preparatory field phase of his work we have recognised that there is no typical Dachstein Limestone among the breccia graines described by FÜLÖP (1958). Instead of this the limestone debris is pale grey and there are only slight differences only (*Figure 3a, b*). Looking at the thin sections in details it turned out that there is no evidence for the presence of the Dachstein Limestone among the debris at all. This was the fact which inspired the initiation of a thorough micropalaeontological study to clear up the age of the clasts and the their matrix. For this purpose using thin sections from a few surface outcrops (e.g. Törökbükk, Lábatlan; Szél Hill, Tardos; Tűzkő Hill, Szomód; Alsó-Látó Hill, Tardos and Paprét Ravine, Süttő) and a few core samples from the Tardosbánya Tb–1 borehole) were investigated.

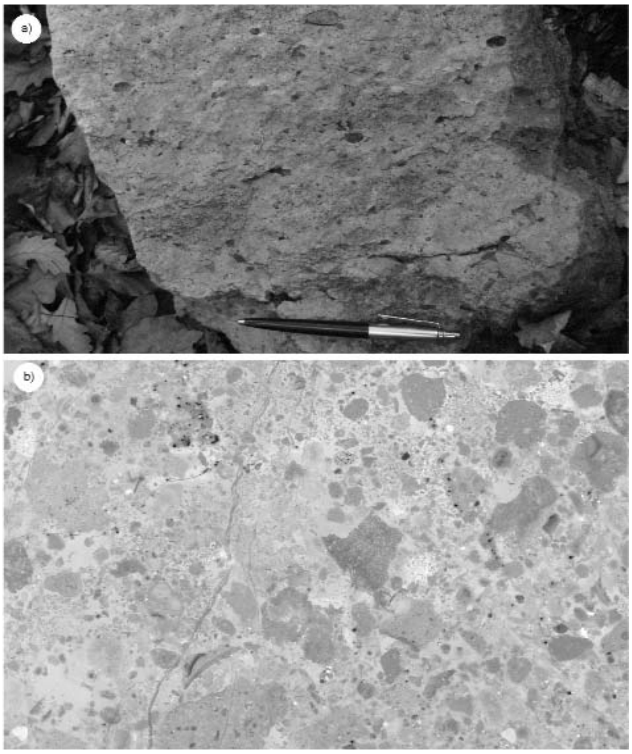

Figure 3. a) Bedding plane of the Felsővadács Breccia, Paprét Ravine, Süttő, b) Polished surface of a Felsővadács Breccia slab, Törökbükk, Lábatlan village. Lenght of the photo is 8 cm.

3. ábra. *a) A Felsővadácsi Breccsa rétegfelszíne a Paprét-árokban, b) A Felsővadácsi Breccsa polírozott felszíne a lábatlani Törökbükkről*

The textural pattern and microfossil study of the limestone clasts and the matrix

As can be seen by the unaided eye the shape and the size of the limestone debris are varied. Their size can vary from sand-grain size up to ten cm. The shape can be well-rounded and also subangular (albeit rarely) but there are lots of examples of debris whose shape is irregular; these can be convex and concave at the same time. This feature is particularly convincing in thin sections. There are cases where the boundary between the clasts and the matrix is not simple to recognize. The matrix is mainly micritic, mudstone-type but in those cases when the breccia has been deposited in calcareous environment it may also contain pelagic microfossils (e.g. calpionellids) as well. The texture of the limestone clasts varies from wackestone up to grainstone. The allochems consist of bioclasts and pelletal grains here.

From the studies mentioned above it was learned that in the Felsővadács Breccia there are practically no megafossils and in the group of microfossils green algae and foraminifera predominate. Both of them can be studied in thin sections but when examining the foraminifera a dissolution residue of concentrated acetic acid was also used for the clasts and the matrix independently.

Amongst the occurring benthic foraminifera the following taxa are worth while mentioning *Andersenolina alpina* (LEUPOLD), *Andersenolina elongata* (LEUPOLD), *Andersenolina* cf. *delphinensis* (ARNAUD-VANNEAU, BOISSEAU & DARSAC), *Mohlerina basiliensis* (MOHLER) (*Figure 4*), *Protopeneroplis* cf. *ultragranulata* (GORBATCHIK), *Pseudocyclammina lituus* (YOKOYAMA) (*Figure 5*), *Redmondoides lugeoni* (SEPTFONTAINE). The isolated fauna gained by treatment with acetic acid shows the existence of a few microfossils: the most

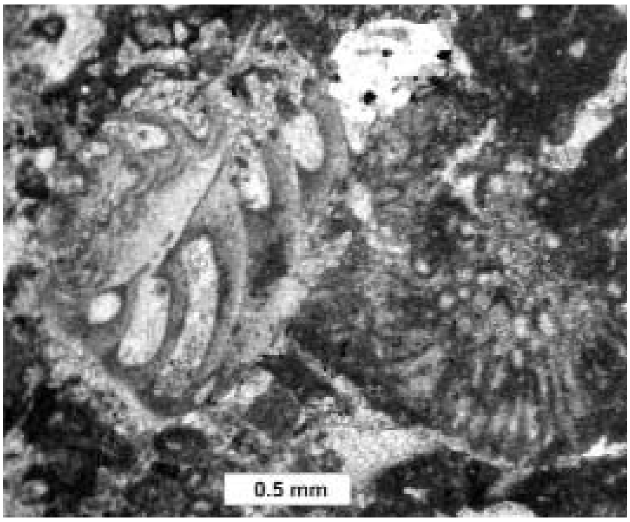

Figure 4. *Mohlerina basiliensis* (MOHLER) benthic foraminifera in thin section, Törökbükk section, Lábatlan

4. ábra. *Mohlerina basiliensis (MOHLER) bentosz foraminifera vékonycsiszolatból a lábatlani Törökbükk szelvényéből*

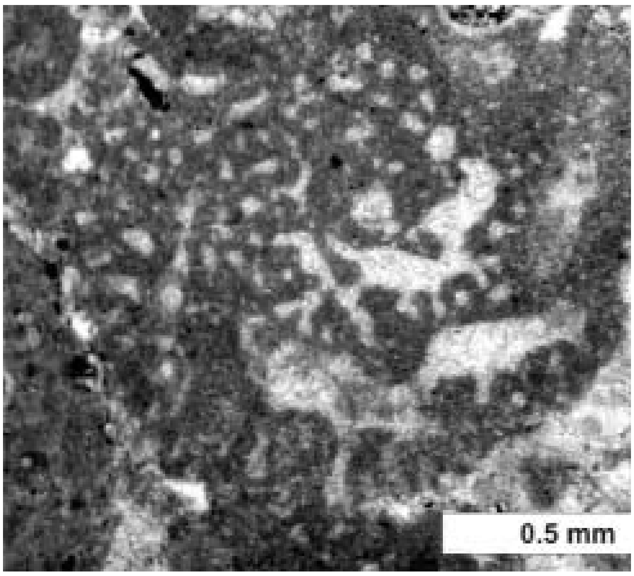

Figure 5. *Pseudocyclammina lituus* (YOKOYAMA) benthic foraminifera in thin section, Törökbükk section, Lábatlan

5. ábra. *Pseudocyclammina lituus (YOKOYAMA) bentosz foraminifera vékonycsiszolatban a lábatlani Törökbükki szelvényből*

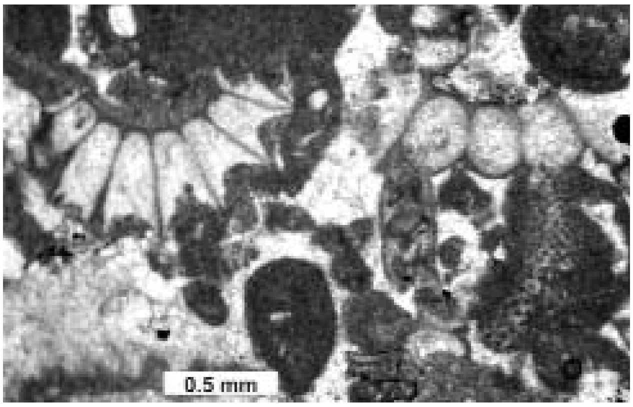

Figure 6. *Clypeina sulcata* (ALTH.) Dasycladalean alga in thin section, borehole Tardosbánya Tb-2, 115.5 m

6. ábra. *Clypeina sulcata (ALTH.) Dasycladacea-metszet a Tardosbánya Tb-2 fúrás 115, 5 méteréből*

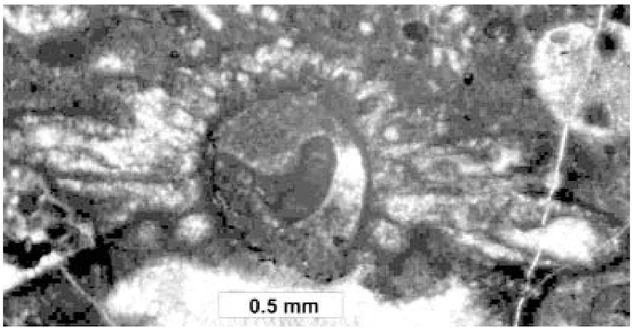

Figure 7. *Actinoporella podolica* (ALTH.) Dasycladacean alga in thin section, Szél Hill, Tardosbánya village

7. ábra. *Actinoporella* aff. *podolica (ALTH.) Dasycladacea-metszet a tardosi Szél-hegy déli szelvényéből*

abundant are the foraminifera, but there are also minor contents of the valves of ostracods and recrystallized radiolarians. The most characteristic foraminifers are *Trocholina* sp., *Tritaxia* sp., *Lenticulina* sp. and *Patellina* sp. Amongst the dasycladalean algae *Clypeina sulcata* (ALTH.) (*Figure 6*) is the most common, other taxa are *Clypeina* cf. *estevezi* GRANIER, *Salpingoporella annulata* CAROZZI and *Selliporella* aff. *neocomiensis* (RADOICIC) and *Actinoporella* aff. *podolica* (ALTH.) (*Figure 7*). Debris of *Thaumatoporella parvovesiculifera* (RAINERI) and nodules of *Lithocodium– Bacinella* are fairly common. From a biostratigraphic point of view with respect to microfacies, the dominance of clasts (wackestones) indicating to a lagoonal environment is striking.

The age of the Felsővadács Breccia

The exact age of the Felsővadács Breccia is not known. Based on ammonites VÍGH (1984) was the first to mention that these beds were probably deposited at the turn of the Berriasian to the Valanginian. While studying nannofossils FOGARASI (2001) came to a similar conclusion (i.e. Late Beriasian to Early Valanginian). Some poorly preserved ammonoids found in the upper breccia layer of the Paprét Ravine section indicate a Berriasian age (FŐZY 1993). According to BÁRÁNY (2004) the age of the uppermost bed of this member rank unit is Early Valanginan as it is shown by *Calpionellites darderi* derived from the upper bedding plane of this layer. The association of benthic foraminifers and dasycladalean algae (mentioned above) indicates a Late Tithonian – Berriasian age. Given the recent state of knowledge on this subject it can not be excluded that there could be recognizable differences between the lowermost and uppermost layers, because the numbers of beds and their respective thicknesses vary significantly. To discover the ages of different beds needs more extended systematic studies.

Conclusions

— The predominant part of the limestone clasts derives from a Late Tithonian to Berriasian carbonate platform of an unknown lithostratigraphic unit. This is characterized by *Clypeina sulcata* and some other green algae and also benthic foraminifera like pseudocyclamminids, protopeneroplis and trocholiniform taxa. In addition to these a few *stromatoporids* also occur.

— The other relatively frequent limestone clast is the *Calpionella* limestone, which may belong to the Szentivánhegy Limestone. This is typical for the basinal and submarine high facies of the Transdanubian Range including the Gerecse Mountains.

— It is supposed that the source area is located to the north of the Gerecse Mountains, where the carbonate platform has been developed on the southern margin of the quondam island arc. The radiolarite and mafic magmatic rock of the oceanic basement obducted on this island arc (from where they together with the platform carbonate and other volcanic rocks eroded into the back arc basin) is now called the Gerecse Mountains.

The unconsolidated lime mud on the carbonate platform and submarine highs within the back arc basin might have produced the matrix for the Felsővadács Breccia.

The pebbles of the mafic and ultramafic rocks with chrom spinell bear witness to the nearby location of the island arc with an oceanic basement.

This event can be correlated well with the Barmstein Breccia in the Northern Calcareous Alps (GAWLICK et al. 2005, FRISCH & GAWLICK 2003, SCHLAGINTWEIT & GAWLICK 2007) and also with the Nozdrovice and the Walentowo Breccia (KROBICKI & SLOMKA 1999) in the Western Carpathians (and also with respect to the lithologic composition). The appropriate stratigraphic correlation and palaeogeographic implications of these formations will be considered in an other paper currently under preparation.

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