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Crinoid skeletal ossicles in the Šléglov Formation of the Velké Vrbno Dome (Moravia, Czech Republic) and their stratigraphic significance

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ABSTRACT. Isolated crinoid columnals and brachials were found in metamorphic limestones of the Šléglov Formation in the Velké Vrbno Dome. The occurrence of columnals, belonging probably to the genera Myelodactylus, Diamenocrinus and Cupressocrinites, documents the Early Devonian (possibly Lochkovian-Zlíchovian) age of the Šléglov Formation.

■ **Crinoidea, skeletal ossicles in metamorphic sediments, stratigraphy, Devonian, Pragian-Zlíchovian, Šléglov Formation, Velké Vrbno Dome, Moravia, Czech Republic**

Crinoid skeletal ossicles, mostly columnals and brachials, were found in thin sections made from metamorphic limestones of the Šléglov Formation (Koverdynský 1993, 1994) of the Velké Vrbno Dome. This surprising find documents the Early Devonian (probably Pragian-Zlíchovian) age of the Šléglov Formation and extends the occurrence of the Devonian strata from the Branná (Kolstein) Zone to the west. The geological investigation and mapping of the Velké Vrbno Dome had been completed by Květoň in 1951. Květoň divided the sequence of strata in this dome into three stratigraphic units. The lower, "clastic" series was classified, according to its lithological character, as Ordovician. The middle part with abundant carbonates and locally developed dark siliceous schists was classified as Silurian. Upper part of the sequence, developed again in clastic facies, Květoň regarded as a regressive sediment of the uppermost Silurian.

Investigations carried out during the 1960s, declared, to the contrary, that the sequence of Velké Vrbno Dome is of Proterozoic age. This theory, based on lithological similarity of the Velké Vrbno Series and the so-called "motley development" of the Proterozoic rocks in the Moravicum, Silesicum and Lugicum areas (Mísař 1963), predominates till the present time.

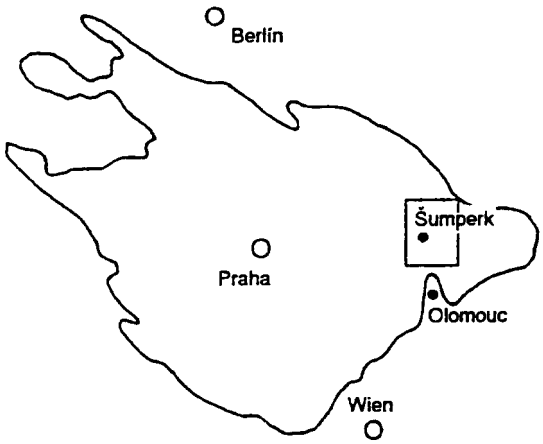

Fig. 1: Examined area in the Bohemian Massif.

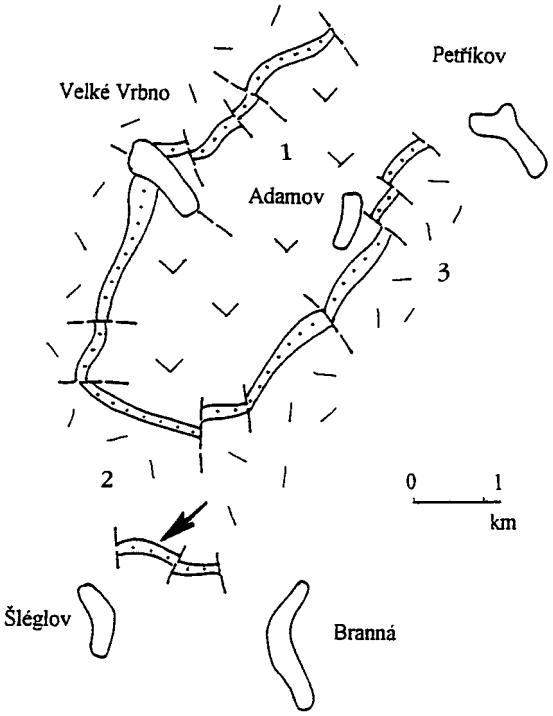

Fig. 2: Schematic sketch showing the position of the locality with discovered fauna (marked by arrow). Lithostratigraphic units: 1. Adamov Formation, 2. Šléglov Formation, 3. Petříkov Formation.

Recent research changed our knowledge of the lithological character of the rock forming the Velké Vrbno Dome. The "clastic sediments" are, in fact, product of acid volcanism. They were divided into two stratigraphic units: Adamov and Petříkov Formations (Koverdynský 1969, 1972, Opletal et al. 1995), interpreted as Ordovician-Silurian. The volcanic activity lasted till the Lower Devonian and finished in the lower part of the Šléglov Formation. The strata overlying volcanites are developed as metamorphic shales and limestones, in which a crinoidal fauna has been discovered. This find supported the stratigraphic and tectonic interpretations of the geological structure of the Velké Vrbno Dome, i.e. the limestones of the Šléglov Formation probably represent only relicts of primary synclines bordering the core of dome. The fauna was discovered both in the relicts of the outer fringe, at the graphite deposit "Hubert" at Šléglov, and in the inner fringe, at the graphite deposit "Konstantin" at Velké Vrbno. The best preserved fauna comes from an outcrop of limestones ca. 1000 m SSE of "Kutný vrch" hill. Relicts of the original sedimentary structures preserved in the limestones, dolomitic limestones and dolomites bring evidence that all these sediments represent shoal deposits. Crinoid ossicles (i.e. columnals or stem fragments and brachials, respectively), studied on thin sections, are locally abundant. They are concentrated above in the dark, schlieric parts of rock that represent original micritic-argillaceous sediment. In light-grey parts, representing originally pure limestones, the crinoid remains were damaged by recrystallization.

[A record of unclear remnants of fossils believed to represent columnals of crinoids and echinoid spines (?) has been reported from this locality, i.e. the graphite quarry "Konstantin" by Hladil & Čejchan (1994)].

The columnals ascertained are mostly small (0.2-2.6 mm in diameter), cylindrical, rounded in outline, with minute central circular or pentastellate lumen usually filled with a dark-grey or black matrix. Elliptical or subcrescent columnals with narrow, slotted lumen, which belong to the crinoids of a myelodactylid type, namely to the genus *Myelodactylus* s.s. (Lower Silurian – Middle Devonian of Europe, Asia and North America) occur rarely. The next morphological form of columnals is the pentalobate one, with relatively broad, circular, centrally located lumen. These columnals are characteristic for the crinoids of the family Rhodocrinidae, especially the genus *Diamenocrinus*, which

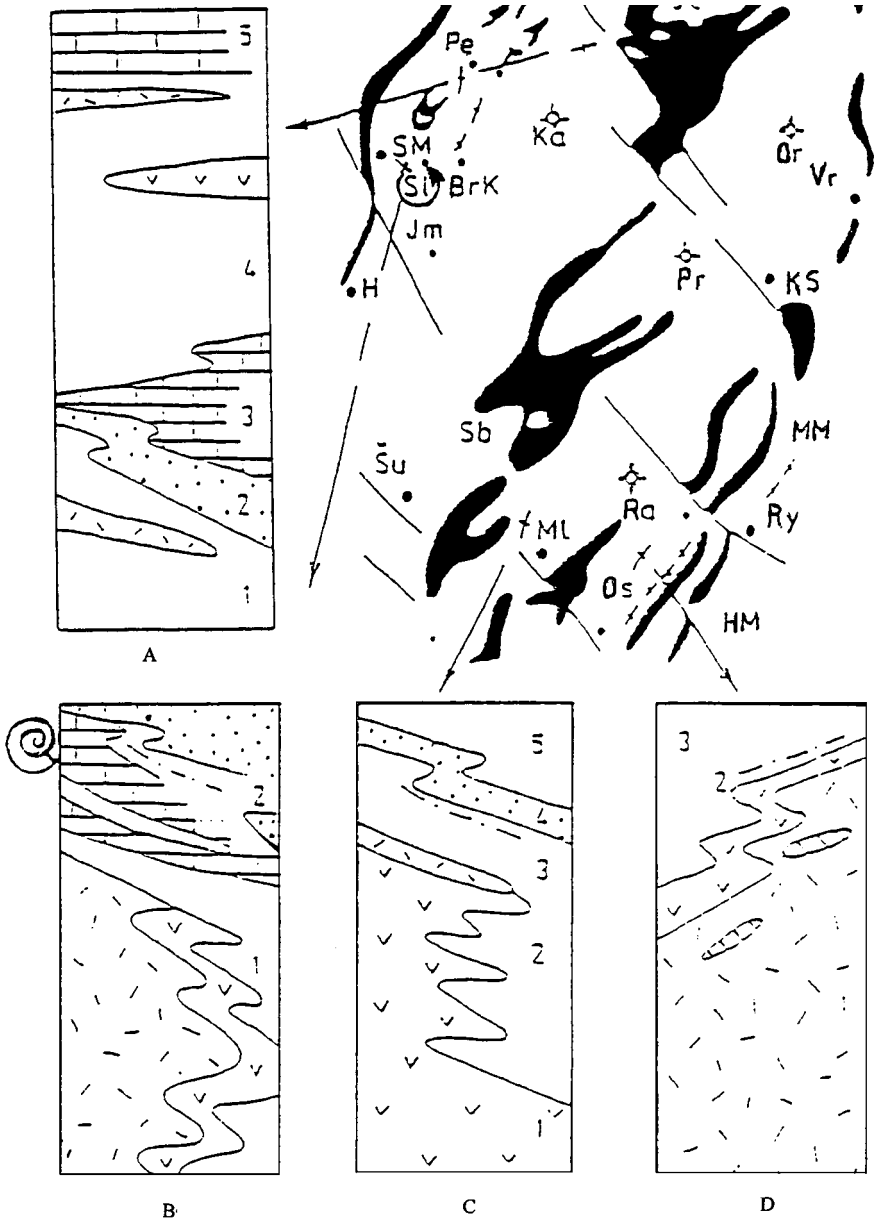

Fig. 3: Scheme of the lithostratigraphical development of the examined area in the Silesicum. A - The nothern part of the Branná (Kolštejn) Group and its basement. 1: Jindřichov Formation, 2: Ramzová quartzites, 3: Lipová limestones, 4: Staříč Formation, 5: Vitošov limestones. B - Velké Vrbno Group. 1: Petříkov and Adamov Formations, 2: Šléglov Formation. C – Desná Unit.1: Sobotín volcanic complex, 2: Desná paragneiss, 3: Mladoňov Formation, 4: Drakov quartzites, 5: Dark phyllites of the Vrbno Group. D - The south part of the Vrbno Group. 1: Horní Město volcanic complex, 2: Ponikev Formation, 3: Janovice Formation. Abbrevitations of the names of communities: BrK = Branná (Kolštejn), Bu = Budišov, H = Hanušovice, HM = Horní Město, Ke = Keprník, KS = Karlova Studánka, Je = Jeseník, Ml = Mladoňov, MM = Malá Morávka, Or = Orlík, Os = Oskava, Pe = Petříkov, Pr = Praděd, Ry = Rýmařov, Sb = Sobotín, SM = Staré Město, Šl = Šléglov, Šu = Šumperk, Vr = Vrbno.

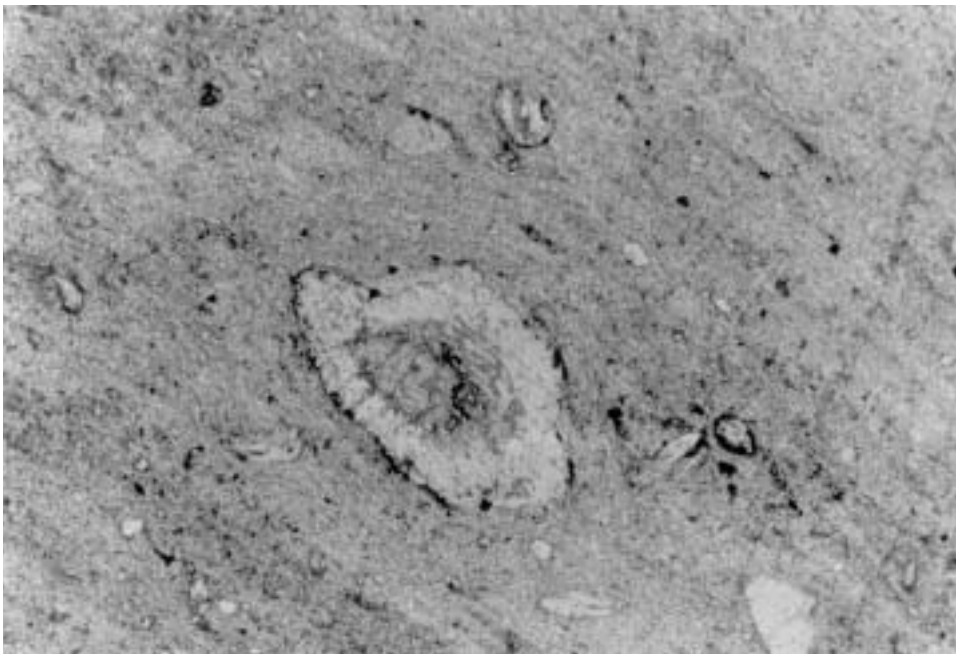

Fig. 4. Rock slice from the crystalline limestone of the Šléglov Formation with the sections of determined crinoidal columnals: oblique section of a big columnal of the crinoid genus Myelodactylus (in the centre).

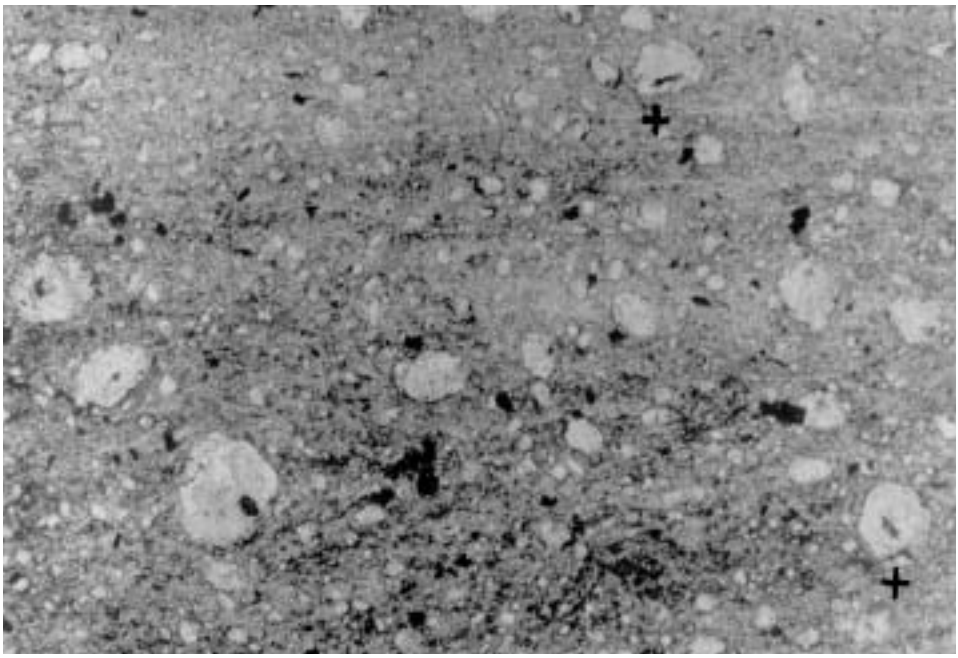

Fig. 5. Rock slice from the crystalline limestone of the Šléglov Formation with the sections of determined crinoidal columnals: two sections of the typical columnals of the crinoid genus Myelodactylus (marked by cross).

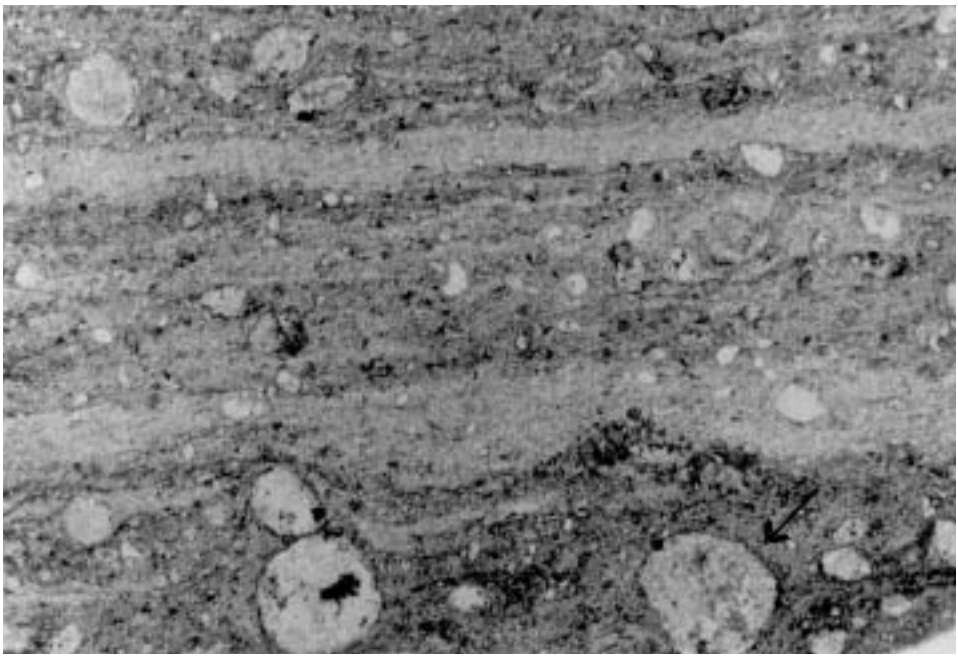

Fig. 6. Rock slice from the crystalline limestone of the Šléglov Formation with the section of determined crinoid columnals: section of cupressocrinid columnal, most likely of the genus Cupressocrinites (marked by cross).

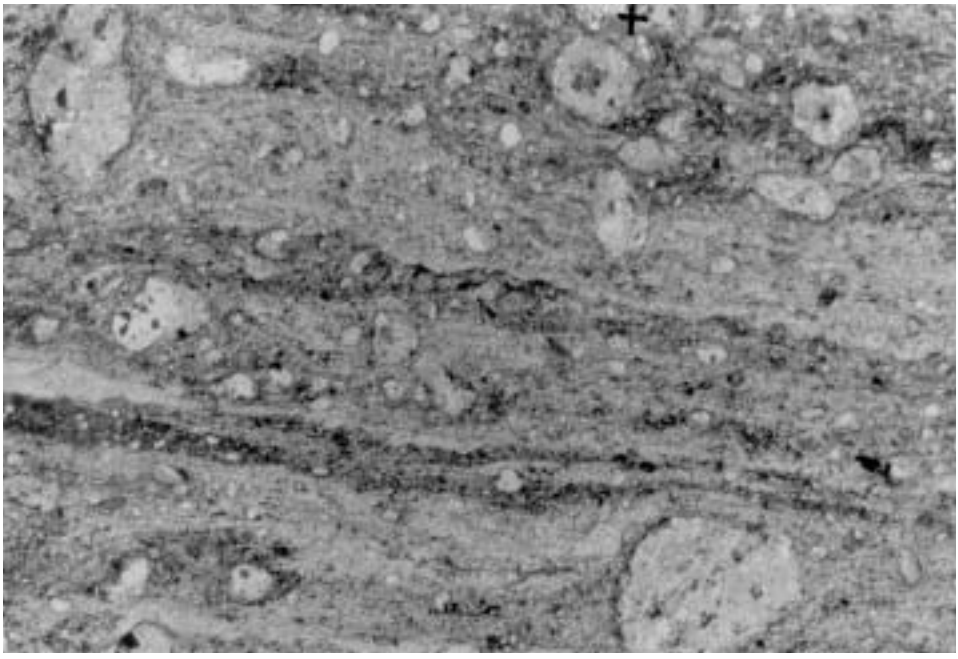

Fig. 7. Rock slice from the crystalline limestone of the Šléglov Formation with the section of determined crinoid columnals: section of a columnal of the prominent lower Devonian crinoid Diamenocrinus (marked by arrow).

is common in Lower Devonian sediments of Europe, North Africa and Asia. Rounded tetragonal columnals with cross-shape lumen resembling the common Devonian crinoid genus Cupressocrinites occur rarely. Thin sections of brachials mostly testify to minute, morphologically uniform, relatively thin-walled, semicircular or circular ossicles with rounded, open, centrally placed ambulacral grooves. Barely come massive, oval in outline, disproportionate brachials of an unknown genus, having a laterally shifted, narrow, deep and V-shaped ambulacral grooves.

CONCLUSIONS

Find of the crinoid ossicles in the limestones of the middle and upper parts of the Šléglov Formation of the Velké Vrbno Dome in the Hrubý Jeseník Mts. principally changed the hitherto dominant opinion on the Proterozoic age of these strata. On the basis of the occurrence of crinoid columnals belonging most probably to the genera Myelodactylus and Diamenocrinus and of the massive disproportionate brachials of an unknown genus (but very common in the washings from the Lower Devonian, especially Pragian and Zlíchovian (= Lower Emsian) limestones in the Barrandian area, it is possible to assume that the limestones of the Šléglov Formation are Lower Devonian in age. It may also verify the age of the underlying volcano-sedimentary complex of the Petříkov and Adamov Formations as Ordovician-Silurian. This volcanism (including stratiform mineralization) that finished in Early Devonian, represents the basal part of the Šléglov Formation in the Velké Vrbno Dome. The rock slices examined are housed in the collections of the „Geoetika“, Jasánky u Zábřehu.

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