

Lower Devonian conodonts from the Pod Barrandovem section

Ladislav Slavík¹

¹Institute of Geology of the CAS, v.v.i., Rozvojová 269, 16500 Praha 6, Czech Republic; slavik@gli.cas.cz

Locality - The Lochkovian-Emsian section at Pod Barrandovem is a steep partly quarried slope on the left bank of the Vltava River, on the southern periphery of Prague at Hlubočepy (Fig. 1). The section is exposed by an old roadcut and by many pits and quarries (e.g., U kapličky Quarry, Fig. 2). (GPS positioning of the U kapličky Quarry: N 50°02'17" E 14°24'14").

Lithostratigraphic units - Lochkov Fm., Praha Fm., Zlíchov Fm.

Age - Lochkovian to Emsian. The conodont zones included: gilberti-steinachensis beta, steinachensis beta-brunsvicensis, brunsvicensis-celtibericus, celtibericus and excavatus/gracilis (in the sense of Slavík, 2004; Slavík et al., 2012 and Valenzuela-Rios et al., 2015).

What to see - An extensive section across the Lower Devonian with many sedimentological and structural phenomena and contrasting facies, some parts of the section are richly fossiliferous.

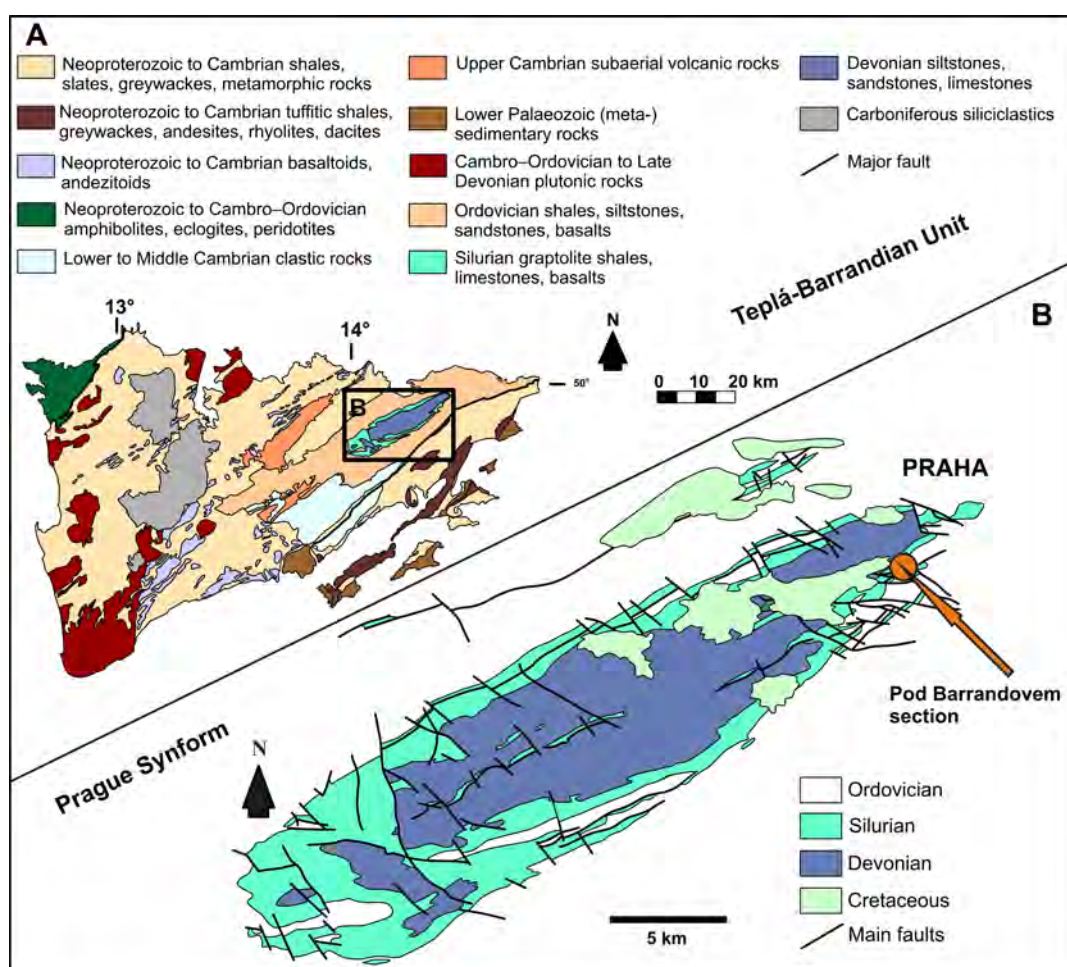


Figure 1. A location of the Pod Barrandovem section in the Prague Synform (i.e a part of the Teplá-Barrandian Unit).

How to get there

The section can be easily reached from the Hlubočepská street in Praha-Hlubočepy, the section starts just behind the parking place with Zlíchov Fm.



Figure 2. A part of the extensive Pod Barrandovem section: **A.** Upper parts of the Praha Fm. (Dvorce-Prokop Ls.) in the U kapličky (Chapel) Quarry. **B.** A detail of the boundary between Praha and Zlíčov Fms. Note the synsedimentary slumps just below the "Chapel Breccia" of the Zlíčov Fm.

Historical outline

The Barrande's Rock is a classical outcrop that has been drawn by the founder of the Czech geology J. Krejčí and also by J. Barrande in his field-notebooks (second half of the 19th century). The memorial plaque with the name "Barrande" was placed on the rock wall in 1884 (one year after the Joachim Barrande's death). The above building estate Barrandov was officially named in his honour in 1928.

Previous conodont studies concentrated only on the boundary interval between the Praha and Zlíčov Formations. Schönlaub (in Chlupáč et al., 1980) reported "*Po. dehiscens*" and "*Icriodus bilatericrescens*" from the uppermost part of the Praha Fm., only several meters below the lower boundary of the Basal Zlíčov "Chapel breccia" (Zlíčovian). An extensive sampling of the entire section with the Praha Fm. (Pragian and Emsian in age) started in 2000 and the data have been published in Slavík (2004) and Slavík et al. (2007).

Da Silva et al. (2016) used the conodont data from the Pod Barrandovem section for bracketing of interval with high-resolution magnetic susceptibility and gamma ray spectrometry records. It was aligned with corresponding intervals from other two sections. Multiple spectral analysis and statistical techniques were used in concert to reach an optimal astronomical interpretation. The new age model results in durations of 5.7 ± 0.6 Myr for the Praha Fm. and of 1.7 ± 0.7 Myr for the Pragian Stage.

Sedimentology and paleoenvironmental indicators

In the south, the Barrande's Rock shows strongly and irregularly folded Lochkovian beds of rhythmically alternating limestones and black shales. The facies is close to Radotín Ls. A rigid and slightly folded structure-ramp segment of Praha Fm. limestones occurs further to the north. Both the preservation and the exposure of the Praha Fm. in section are excellent. For detailed descriptions of the locality see e.g., Chlupáč et al. (1986) and Slavík & Hladil (2000). According to both macropaleontological and micropaleontological data the section across the Praha Fm. is practically complete and undisturbed, with the exception of narrow zones at the very base and the top of the succession, where tectonic detachments from the underlying Lochkov and overlying Zlíčov formations cause some problems in high-resolution stratigraphy (a relatively short interval at the very base of the Praha Fm., where approximately 10 m of the Slivenec limestones is missing and a short potential gap at the contact with the overlying Zlíčov Fm. An unusual thickness of the Praha Fm. (174 m) corresponds to unusual lithology. Practically the whole section consists of the gray-colored Dvorce-Prokop Ls., where lime- and mud-supported calcisiltites with scattered pelagic fauna are stacked in turbidite beds with sparsely preserved weakly calcareous black-shale background sediment. Uncommon macrofossils (such as orthocone cephalopod shells or trilobite carapaces) are in 'floating' position in the sediment indicating turbidite phases. Grading ends in micrites or shales, and even thin

deposition units are top-down bioturbated by numerous *Chondrites* and also a few *Zoophycos* ichnofossils. Only a few lowermost meters of the sediment contain abundant debris of abraded, partly ferruginous crinoid columnals (Slivenec Ls. with rose color hue). These detrital limestones are overlain by a thin interval of varicolored micrite beds – transitional facies to Dvorce-Prokop Limestone Ls.

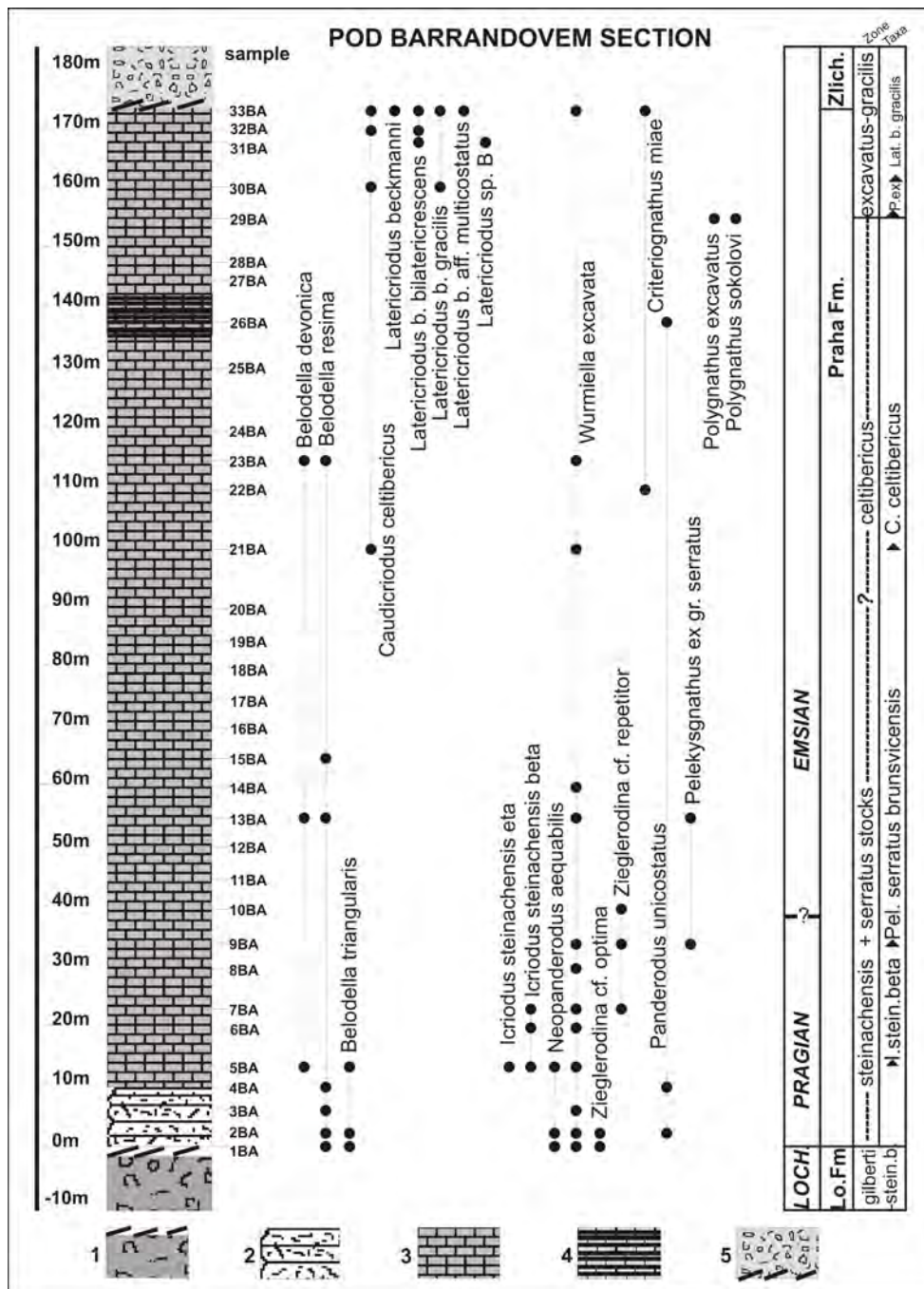


Figure 3. Conodont distribution in the Pod Barrandovem section. Conodont data upgraded from Slavík (2004). Lithology: 1. Lochkovian – “Improper” Radotín Ls. – darker, platy with calcareous shale intercalations and cherts, in uppermost part are faults and tectonic breccias. 2. “improper” Koněprusy Ls. and Slivenec Ls. - bioturbated whitish to light pinkish limestones. 3. Dvorce-Prokop Ls. – grey to light grey lime-mudstones with nodules at higher parts with shale intercalations. 4. Equivalent of the so-called “Graptolite level” - grey packstone beds with intercalations of dark shale. The intercalations of shales are more apparent and thicker than in underlying and overlying parts of Dvorce-Prokop Ls. 5. – Basal Zlíčov “Chapel breccia” – organoclastic breccia with very rich fauna with corals and syndepositional slumps and faults at the base.

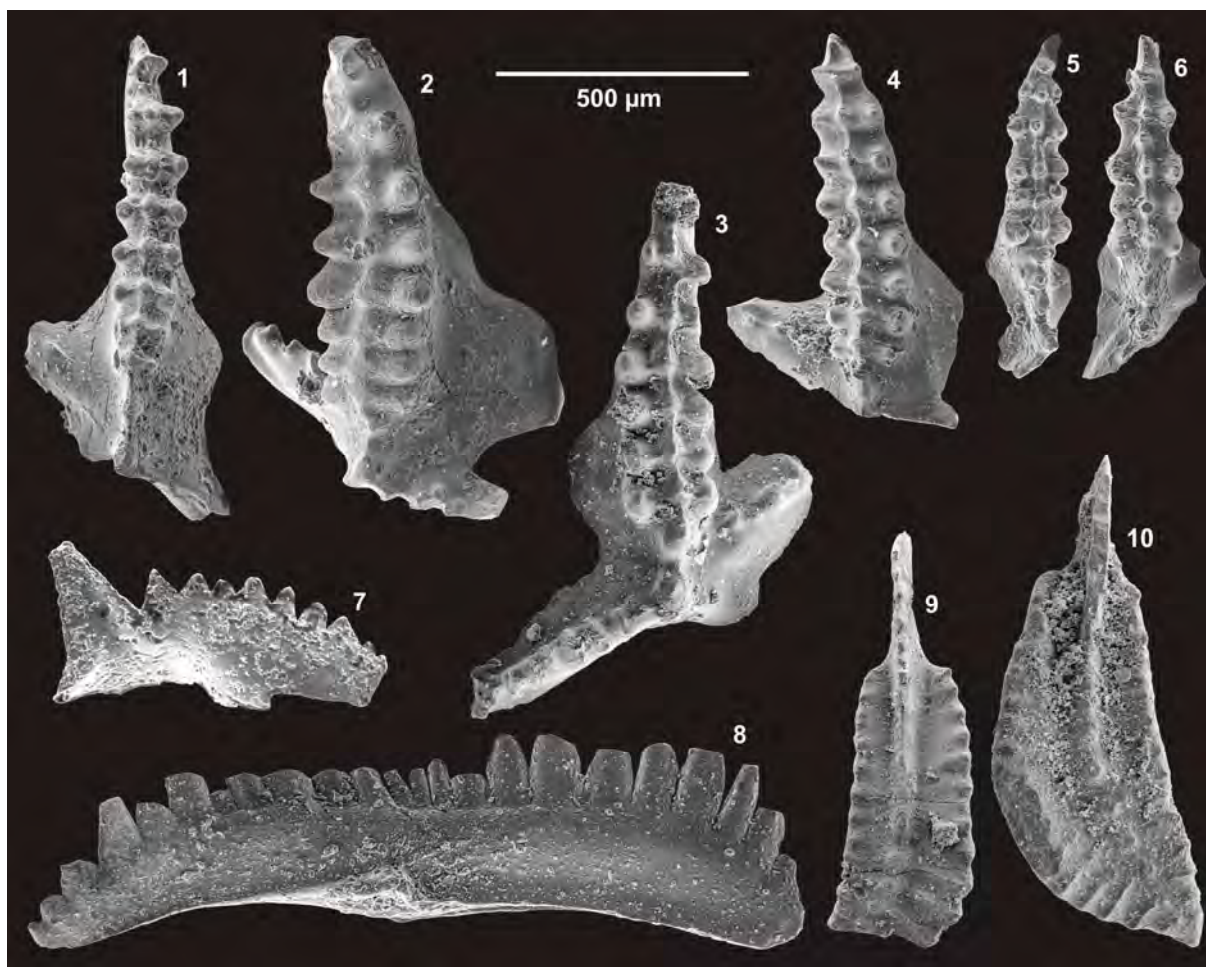


Figure 4. Selected conodont specimens from Lower Devonian of the Pod Barrandovem section.

1. *Latericriodus bilatericrescens gracilis* Bultynck, upper view of I element, sp.No: 310BA, sample 30BA. **2.** *Latericriodus beckmanni* (Ziegler), upper view of I element, sp.No:327BA, sample 33BA. **3.** *Latericriodus bilatericrescens bilatericrescens* (Ziegler), upper view of I element, sp.No: 340BA, sample 33BA. **4.** *Latericriodus bilatericrescens* aff. *multicostatus* (Carls & Gandl), upper view of I element, sp.No: 311BA, sample 33BA. **5-6.** *Caudicriodus celtibericus* (Carls & Gandl), **5.** upper view of I element, sp.No: 303BA, sample 33BA, **6.** upper view of I element, sp.No: 304BA, sample 33BA. **7.** *Pelekysgnathus serratus brunsvicensis* Valenzuela-Ríos, lateral view of Pa element, sp.No: 314BA, sample 13BA. **8.** *Wurmiella excavata* (Branson & Mehl), lateral view of Pa element, sp.No: 334BA, sample 2BA. **9.** *Polygnathus excavatus* (Carls & Gandl), upper view of incomplete Pa element, sp.No:338BA, sample 29BA. **10.** *Polygnathus sokolovi* Yolkin et al., upper view of Pa element, sp.No: 323BA, sample 29BA.

Comments on conodont data

Zieglerodina cf. *optima* (Moskalenko) was documented to occur near the base of the section, proving reworking of beds of the Lochkovian age during the deposition of the first meters of the Praha Fm. (Fig. 3). The number of conodont elements in the first ten meters of the Pragian is very low. Stratigraphically significant taxa are present only in sample 5BA, linked with the onset of nodular lime-mudstones. Both morphotypes (eta and beta) of *Icriodus steinachensis* Al-Rawi are present, and the range of the latter morphotype is wider, partly overlapping the range of *Zieglerodina* cf. *repetitor* (Carls & Gandl). The first appearance of *I. steinachensis* beta morph. characterizes the base of the *steinachensis* beta–*brunsvicensis* Zone. The base of the following *brunsvicensis*–*celtibericus* Zone cannot be established herein on the basis of the first occurrence of *P. s. brunsvicensis* Valenzuela-Ríos that belongs to taxa of the *Pelekysgnathus serratus* group (*Pelekysgnathus* ex gr. *serratus*), being the most important species at this stratigraphic level. The *Icriodus steinachensis* and

Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 23	Valencia 2017
<i>International Conodont Symposium 4</i>		Valencia, 25-30 th June 2017	

Pelekysgnathus serratus stocks are the basis for the alternative early Pragian conodont correlation (Slavík et al., 2007). The boundary between Pragian and Emsian Stages can be estimated within the range of pelekysgnathids (cf. Carls et al., 2007 and Slavík et al., 2007). The interval from the last occurrence of *Pelekysgnathus* upwards (almost 40 meters thick), is almost barren as regards conodonts and the conodont zone can be only estimated without indication of the zonal boundaries. This is a typical feature of the presumably environmentally hostile middle Praha Fm. Representatives of the genus *Caudicriodus* (Bultynck) start to appear in the upper part of the section. The most relevant form in the upper part of the Praha Fm., in spite of its scarcity, is *Caudicriodus celtibericus* (Carls & Gandl) – a name-giving taxon of the early Emsian zone, the *celtibericus* Zone. Only few elements of *Wurmiella* Murphy et al. and some coniform elements are also present here. Due to the absence of relevant conodonts, it is impossible to locate precisely the boundary between the *brunsvicensis-celtibericus* and *celtibericus* Zones. The upper limit of the latter is defined by the appearance of first polygnathids – *Po. excavatus* (Carls & Gandl) and *Po. sokolovi* Yolkin et al. The *excavatus* Zone is documented herein on the basis of this single occurrence of its name-bearer. Although several specimens were attributed by Schönlaub (in Chlupáč et al., 1980, Pl. 21, figs. 2-4, 6, 8-17) to *Po. dehiscens* (in broader sense), they are regarded here, at least according to their platform shape, to be morphologically close to *Po. excavatus* (Carls & Gandl). A few of the stratigraphically significant taxa of the *Latericriodus bilatericrescens* group were recorded in the uppermost part of the "traditional" Pragian (upper parts of the Praha Fm.). Important is the stratigraphic succession of individual members of this group. Similarly as in the Moroccan Meseta (Bultynck, 1985), *Latericriodus bilatericrescens gracilis* Bultynck occurs in the lowermost position. *Latericriodus b. bilatericrescens* (Ziegler) was documented several meters higher. A mixed conodont association is present immediately below the Basal Zlíčov "Chapel breccia", combining different forms such as *L. b. bilatericrescens*, *L. b. gracilis*, *L. b. aff. multicostatus* (Carls & Gandl), *Criteriaognathus miae* (Bultynck) and *C. celtibericus* (sample 33BA, see Figs 3 and 4). Their co-occurrence may be caused by reworking, and exceptional stratigraphical bias is related to small-scale tectonic structures below the base of the Basal Zlíčov "Chapel breccia".

Acknowledgements

The study was supported by the research plan RVO67985831 of the Institute of Geology of the CAS, v.v.i.

References

- BULTYNCK, P. (1985): Lower Devonian (Emsian) - Middle Devonian (Eifelian and lowermost Givetian) conodont successions from Ma'ader and the Tafilalt, southern Morocco. - *Courier Forschungsinstitut Senckenberg*, 75: 261-286.
- CARLS, P., SLAVÍK, L. & VALENZUELA-RÍOS, J.I. (2007): Revisions of conodont biostratigraphy across the Silurian-Devonian boundary. - *Bulletin of Geosciences*, 82(2): 145-164.
- CHLUPÁČ, I., HLADIL, J. & LUKEŠ, P. (eds, 1986): Field Conference of the ISDS Barrandian-Moravian Karst. - A Field Trip Guide Book, 61 p., Praha.
- CHLUPÁČ, I., KRÍŽ, J. & SCHÖNLAUB, H.P. (1980): Silurian and Devonian conodont localities of the Barrandian. - In: SCHÖNLAUB, H.P. (ed.): Guidebook and Abstracts, Second European Conodont Symposium - ECOS II. - *Abhandlungen der Geologischen Bundesanstalt*, 30: 147-180.
- DA SILVA, A.C., HLADIL, J., CHADIMOVÁ, L., SLAVÍK, L., HILGEN, F.J., BÁBEK, O. & DEKKERS, M.J. (2016): Refining the Early Devonian time scale using Milankovitch cyclicity in Lochkovian–Pragian sediments (Prague Synform, Czech Republic). - *Earth and Planetary Science Letters*, 455: 125-139.

Ber. Inst. Erdwiss. K.-F.-Univ. Graz	ISSN 1608-8166	Band 23	Valencia 2017
<i>International Conodont Symposium 4</i>		Valencia, 25-30 th June 2017	

SLAVÍK, L. & HLADIL, J. (2000): Anatomy of the Pragian stratigraphic column: Gamma spectrometric record throughout complete 170-m thick Pragian section in Calciturbidite/Hemipelagite Facies (Prague, Section "Under Barrandov bridge"). - Subcommission on Devonian Stratigraphy Newsletter, 17: 46-47.

SLAVÍK, L. (2004): A new conodont zonation of the Pragian in the Stratotype area (Barrandian, central Bohemia). - Newsletters on Stratigraphy, 40/1,2: 39-71.

SLAVÍK, L., CARLS, P., HLADIL, J. & KOPTÍKOVÁ, L. (2012): Subdivision of the Lochkovian Stage based on conodont faunas from the stratotype area (Prague Synform, Czech Republic). - Geological Journal, 47: 616-631.

SLAVÍK, L., VALENZUELA-RÍOS, J.I., HLADIL, J. & CARLS, P. (2007): Early Pragian conodont-based correlations between the Barrandian area and the Spanish Central Pyrenees. - Geological Journal, 42: 499-512.

VALENZUELA-RÍOS, J.I., SLAVÍK, L., LIAO, J.-C., CALVO, H., HUŠKOVÁ, A. & CHADIMOVÁ, L. (2015): The middle and upper Lochkovian (Lower Devonian) conodont successions in key peri-Gondwana localities (Spanish Central Pyrenees and Prague Synform) and their relevance for global correlations. - Terra Nova, 27: 409-415.