

Physical record of the Pragian time in the Prague Synform and problems with its GSSP delimitation

SLAVÍK, L.¹ & CARLS, P.²

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

(2) Institute of Environmental Geology, Technical University of Braunschweig, Pockelsstrasse 3, D-38023 Braunschweig, Germany

The establishment of the Pragian Stage was originally intended to comply with the complete succession of the lithologically and biostratigraphically well defined Praha Formation in the Prague Synform. The Praha Formation includes several facies types of carbonates with typical open-sea character ranging from extremely shallow-water up to relatively deeper water pelagic (e.g. nodular) limestones deposited with intermediate sedimentation rates (~20 - 25 m/Ma). The thickness of extensive pelagic and calciturbidite systems is changing; the maximum is reached in the Pod Barrandovem section (174 m). Planktonic and widespread reliably correlated faunas are very abundant. Scarcity of detrital input is indicative of significant influence of oceanic conditions. Typical lithologies, distribution of dacryoconarids and even the long migration paths of several benthic faunas – e.g. corals, brachiopods and trilobites enable biostratigraphic and paleoenvironmental/lithological correlations with peri-Gondwanan regions or even more distant areas. All these above-mentioned general aspects of the Pragian in the Barrandian would have been largely accepted, if stratotypes were not defined in the way they are. Present reality concerning the correlation with GSSP's is too different from the detailed correlation based on well-defined individual taxa or reliably dated horizons. In principle, GSSP's are often based either on formalism of biostratigraphic zonation or on the first appearance of a single taxon or specimen that may have several limitations as regards its definition and global dispersal. The problems with the definition of the taxon ("*sulcatus*") that was selected to define the base of the Pragian were discussed in SLAVÍK & HLADIL (2004) and SLAVÍK et al. (2007). However, the base of the Pragian is relatively a minor problem. The major difficulty is the present position of the Pragian/Emsian GSSP that not only reduces significantly the original Pragian (the Praha Fm), but is also very far from the base of traditional German Emsian and classic Emsian bases in other regions.

The definition of many Palaeozoic stages and their inner subdivision is based principally on conodonts. Accordingly, there was permanent need for functional conodont correlation, based on well defined easily recognizable, and, if possible, "cosmopolitan" taxa. The evolution of conodont zonation for the Pragian has had a long history, but nowadays it is obvious that owing to several objective limitations (e.g. faunal differences) we will not ever arrive at an ideally working global conodont scale. In this case is also necessary to consider, whether a correlation based on individual taxa of several faunal groups is not better than sole reliance on formalized conodont zones (which are often problematically defined). Our experience showed that correlation based on representatives of single faunal group can be dangerous and such procedure cannot be recommendable for definition of a GSSP.

The present valid "official" delimitation of the Pragian Stage is thus far from the physical record of geological time of the Pragian in its stratotype area (Prague Synform, Barrandian). Herein is necessary to summarize several serious stratigraphic points concerning the original Pragian:

(1.) Lochkovian/Pragian GSSP boundary definition in the Barrandian was based on the first "*Eognathodus sulcatus*" – a specimen with a clearly developed sulcus (i.e., a distinct evolutionary step). However, the recent concept of "unsulcated" boundary defining specimens (MURPHY 2005) does not correspond with the GSSP. In the sections of the Barrandian appear sulcate specimens already slightly below the Lo/Pg GSSP (SLAVÍK & HLADIL 2004). This has, however, only a minor effect on the correlation of the Lower Pragian boundary.

(2.) Due to scarcity and unreliability of eognathodontids and polygnathids in the Barrandian area, the former and the recent zonal concepts (developed by BARDASHEV et al. 2002 and MURPHY 2005) cannot be applied in the stratotype area. No *Polygnathus kitabicus* (a GSSP defining

species) has been so far reported from the Barrandian area; the oldest described polygnathids (in CHLUPÁČ et al. 1980 and SLAVÍK 2004a) belong to *Polygnathus pireneae* and the *Polygnathus excavatus* group. The regional zonation for the Pragian is based on icriodontids and pelekysgnathids (SLAVÍK 2004b and SLAVÍK et al. 2007).

(3.) Conodonts in the Praha Fm are relatively scarce and most species are largely confined to peri-Gondwana. Nevertheless, reliable inter-regional correlation provides abundant dacryoconarids. The major and abrupt change in dacryoconarid faunas is linked with the boundary between the Praha and the Zlíčov Formations (P. LUKEŠ *pers. comm.*).

(4.) The current GSSP concept of the Pragian/Emsian (P/E) boundary and the recent zonal concept of BARDASHEV et al. (2002, p. 451) have reduced the original Pragian enormously. Only a short lowermost part of the sedimentary succession of the Praha Fm belongs to the "official" Pragian. Accordingly, the majority of the Praha Formation belongs to the Emsian in the current SDS sense (cf. SLAVÍK et al. 2007, CARLS et al. 2008).

(5.) The relative duration of the original Pragian is based on the number (avg.) of counted bedding couplets (high-frequency cycles) in the Praha Fm (cf. CHLUPÁČ 2000, the avg. number is almost 30% of bedding couplets of the entire Lower Devonian succession in the Barrandian). Supposing that bedding couplets have roughly equal length, duration of original Pragian is estimated within the range of 4 - 5 Ma. On the other hand, duration of the "official" Pragian must be within the range of 0.5 - 2 Ma.

5. The most promising marker for the lower Emsian boundary in the Prague Synform is *Icriodus bilatericrescens gracilis* that was recorded in the uppermost part of the Praha Fm. It appears close below the "graptolite event", within the range of *Polygnathus excavatus* and *Turkestanella (Nowakia) acuaria* and just below the acme of *Guerichina ex gr. strangulata* in the latest original Pragian (see SLAVÍK 2004a, CARLS et al. 2008). Based on dacryoconarid correlation (cf. WALLISER & KIM 2001), the corresponding position of the "graptolite event" in Zinzilban might thus be within the interval from 114 and 134 m above the present Pragian/Emsian GSSP, which urgently calls for redefinition.

Acknowledgements

The project was supported by the Grant Agency AS CR (KJB300130613), the Institute of Geology AS CR, v.v.i., general project (AV0Z30130516) and the Alexander von Humboldt Foundation.

References:

- BARDASHEV, I.A., WEDDIGE, K. & ZIEGLER, W. (2002): The polymorphogenesis of some Early Devonian platform conodonts. - *Senckenbergiana lethaea*, 82: 375-451.
- CARLS, P., SLAVÍK, L. & VALENZUELA-RÍOS, J.I. (2008): Comments on the GSSP for the basal Emsian stage boundary: the need for its redefinition. - *Bulletin of Geosciences*, 83: 383-390.
- CHLUPÁČ, I. (2000): Cyclicity and duration of Lower Devonian stages: Observations from the Barrandian area, Czech Republic. - *Neues Jahrbuch für Geologie und Paläontologie, Abhandlungen*, 215: 97-124.
- CHUPÁČ, I., KŘÍŽ, J. & SCHÖNLAUB, H.P. (1980): Field Trip E, Silurian and Devonian conodonts of the Barrandian, Guidebook and Abstracts. Second European Conodont Symposium, ECOS II. - *Abhandlungen der Geologischen Bundesanstalt, Wien*, 35: 147-180.
- MURPHY, M.A. (2005). Pragian conodont zonal classification in Nevada, Western North America. - *Revista Española de Paleontología* 20(2): 177-206
- SLAVÍK, L. (2004a). The Pragian-Emsian conodont successions of the Barrandian area: search of an alternative to the GSSP polygnathid-based correlation concept. - *Geobios*, 37(4): 454-470.
- SLAVÍK, L. (2004b). A new conodont zonation of the Pragian in the Stratotype area (Barrandian, central Bohemia). - *Newsletters on Stratigraphy*, 40(1,2): 39-71.
- SLAVÍK, L. & HLADIL, J. (2004). Lochkovian/Pragian GSSP revisited: evidence about conodont taxa and their stratigraphic distribution. - *Newsletters on Stratigraphy*, 40(3): 137-153.
- 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.
- WALLISER, O.H. & KIM, A.I. (2001). On lowermost Emsian tentaculites from the Zinzilban boundary section and their utility for correlation. - Document submitted to the Subcommittee on Devonian Stratigraphy. May 2001: 2 p.

ZOBODAT - www.zobodat.at

Zoologisch-Botanische Datenbank/Zoological-Botanical Database

Digitale Literatur/Digital Literature

Zeitschrift/Journal: [Berichte der Geologischen Bundesanstalt](#)

Jahr/Year: 2009

Band/Volume: [79](#)

Autor(en)/Author(s): Slavik Ladislav, Carls Peter

Artikel/Article: [Physical record of the Pragian time in the Prague Synform and problems with its GSSP delimitation 36-37](#)