The Arenig/Llanvirn boundary (Ordovician) in the Prague Basin (Bohemia)

Hranice arenig–llanvirn (ordovik) v pražské pánvě (Čechy) (Czech summary)

(2 text–figs.)

JAROSLAV KRAFT* – PETR KRAFT†

* Muzeum dr.B.Hordka, Urbanova nám. 141, 307 01 Rokycany
† Katedra paleontologie, Přírodovědecká fakulta Univerzity Karlovy, Albertov 6, 128 43 Praha 2

Submitted October 12, 1992

Relations within the Klaba/Šárka Formations boundary interval at the Drahouš locality near Rokycany are described. In the lower part of the Šárka Formation, there is one biozone (Corymbograptus retroflexus Biozone) and Bouček’s (1973) horizons are of a local character. The Arenig/Llanvirn boundary is situated above the Klaba/Šárka Formations boundary, because the first appearance of Didymograptus spinulosus Perni is within the Corymbograptus retroflexus Biozone.

Introduction

During the construction of a highway west of Rokycany, the Klaba/Šárka Formations boundary of the Prague Basin Ordovician was uncovered in the area of the classical locality Drahouš (Holub, 1908; Iserle 1903; J.Kraft, 1974; J.Kraft et P.Kraft, 1992). The whole section was macropaleontologically investigated in detail. In addition, samples for supplemental study (micropaleontology, lithology, paleomagnetism, determination of the diagenetic degree, absolute age) were collected.

An intensive research of the Lower Ordovician, and especially of the boundaries between particular stages, is in progress. Therefore, we summarize the most important preliminary results of macropaleontological research of the outcrop in a simple qualitative form in the present paper.

In the Prague Basin, the Klaba/Šárka Formations boundary is exposed at the Ejpovice (Fryda, 1988; Merkl, 1983, 1991; Dzik, 1983) and Strašice (Fryda, 1988; Merkl 1983, 1991) localities. The tuffites and tuffitic shales of the Klaba Formation are overlain there by olistolithic iron ores that belong to the Šárka Formation. Graptolites have not been found in these rocks; an exception is several undetermined stipe fragments from Ejpovice.

The boundary between both formations was also described by Horný et Chlupáč (1952) from the quarry near a sporting airport (Rokycany – Straš Quincy). Deeply weathered yellow clayey shales of the Klaba Formation with relatively common fragments of graptolites, inarticulate brachiopods, trilobites and other fossils contain in their uppermost part (two meters thick) several thin layers of tuffitic shales with different assemblages composed mostly by inarticulate brachiopods. The index fossil of the upper biozone of the Klaba Formation – Tetragraptus reclinatus abbreviatus Bouček – was found as high as three meters below the boundary of the Klaba/Šárka Formations. The shales of the Klaba Formation are followed by an about 1.2 m thick layer of olistolithic iron ore belonging to the Šárka Formation. In its overlay occur disintegrated shales with siliceous concretions containing fauna typical of the Šárka Formation. At present, this sequence is in the filled part of the quarry and is not accessible.

Locality Drahouš near Rokycany

The locality consists of several outcrops (both natural and artificial) exposed during the construction of the highway) in the low slope above the alluvial plane of the Klaba river, about two kilometers WSW of Rokycany, near the Klaba dam.

The westernmost outcrop has been only roughly investigated (Kraft, 1974 – outcrop marked C). At present, the exposures in the eastern part of the locality are obscured by the embankment of the highway.

The sequence exposed includes the uppermost part of the Klaba Formation and the lower part of the Šárka Formation including their boundary. The continuity of the sequence of the Šárka Formation is interrupted by a fault.

The Klaba Formation is formed by grayish–green, grayish–yellow to brownish–yellow clayey shales, which are followed by a 1.9 m
thick layer of tuffites and tuffitic shales in the uppermost part. The Formation is relatively rich in fauna. In the clayey shales, fossils occur individually or more often in clusters (transported fragmentary material), occupying relatively large sections of the surface of the bedding planes. Among graptolites, *Tetragraptus rectilinatus abbreviatus* Bouček and *Azygrograptus suecicus* Moberg are common. Contrariwise, *Holograptus membranaceus* (Bouček) and *Acrograptus strangulatus* (Bouček) are very rare. Dendroides markedly predominate in graptolite assemblage of the Klabava Formation, and *Desmograptus stephanicus* P.Kraft is most common (so far, this species has been known in four specimens only). *Dictyonyma kraftii* Bouček, *Callograptus horakii* (Bouček), *C. zolotcerensis* Bouček, *C. holubi* Bouček, *C. undosus* J.Kraft, *Dendrograptus boucekii* J.Kraft, *Acanthograptus sp.* are rarer. Inarticulate brachiopods *Paldiskites sulcatus* (Barr.), *Rafanoglossa platyglossa* Havlíček and *Conotreta* sp. are common. Locally also chitinozoans (visible to the naked eye) as well as spicules of sponges cover densely large portions of bedding planes. Fragments of conularids and cephalopods (*Bathmoeceras* sp.) are uncommon. In the lower part of the measured section ichnofossils (mostly *Planolites*-like) are locally extremely abundant.

In the overlying tuffitic shales only phosphatic remains (inarticulate brachiopods, rarely conodonts) are found. One bed contains sparsely distributed specimens of *Bergaueria* ichnosp.

The Šárka Formation. The uppermost part of the Klabava Formation, i.e. tuffitic shales and tuffites, is overlain by a 1.1 m thick layer of oolitic iron ore. As the boundary of both formations we consider the base of the iron ore, analogously to other localities (see above).

The remaining section of the Šárka Formation is composed of monotonous gray, grayish-brown to blackish-brown clayey, locally micaceous shales. The fauna of the Šárka Formation is relatively rich and occurs scattered or in small clusters. In the species composition one important change was recorded in the framework of the measured section:


Within the interval of 6.5–8.0 m above the fault there is a change, characterized by a reduction of the number of graptolite species (*Aulograptus* and *Expansograptus* do not continue upwards) and by a decrease in abundance of inarticulate brachiopods. On the contrary, the other fauna begins to occur commonly (articulate brachiopods, mollusks, gastropods, ostracods, trilobites, hyolithids and others) and the number of species increases.

Among taxa which run throughout the measured section, members of the genus *Caryocaris* Salter and graptolite *Corymograptus retroflexus* (Perner) should be mentioned.

---

**Fig. 1.** Measured section at Drahouš with stratigraphical ranges of selected taxa. 1—clayey shales, 2—volcanodetritic rocks, 3—oolitic iron ores.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Formation</th>
<th>Biozone</th>
<th>Stage</th>
<th>Formation</th>
<th>Biozone</th>
<th>Biozone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Llanvirn</td>
<td>Šárka</td>
<td>Didymograptus ciarius</td>
<td>Llanvirn</td>
<td>Šárka</td>
<td>Didymograptus spinulosus</td>
<td>Šárka</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Didymograptus pseudogeminus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corystograptus C. retroflexus retroflexus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. retroflexus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subzone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>C. retroflexus maximosum</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Subzone</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Psilocelmacograptus pantoecus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Horizon</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Expansograptus ferrugineus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arenig</td>
<td>Klabava</td>
<td>Tetraraptus redinatus abbreviatus</td>
<td>Arenig</td>
<td>Klabava</td>
<td>Tetraraptus - Azzyograptus</td>
<td>Klabava</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schizograptus tanobrachiatius</td>
<td></td>
<td></td>
<td>Holograptus tanobrachiatius</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Corystograptus v.-similis</td>
<td></td>
<td></td>
<td>Corystograptus v.-similis</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Biozone</td>
<td></td>
<td></td>
<td>Biozone</td>
<td>Biozone</td>
</tr>
</tbody>
</table>

Fig. 2. Biostratigraphical division of the Klabava and Šárka Formations according to J.Kraft et. P.Kraft. (1992) correlated with Bouček's scheme (1973).

Biostratigraphical notes

The section investigated belongs biostratigraphically to the upper part of the Tetraraptus-Azyogyograptus Biozone (Klabava Formation) and to the lower part of the Corystograptus retroflexus Biozone (Šárka Formation) – see fig. 2.

The distribution of some graptolite species at Drahoňa throw new light upon the biostratigraphy of the lower part of the Šárka Formation.

In the biostratigraphical scheme of the Šárka Formation proposed by Bouček (1973) two horizons were established on its base, as recognized in the iron ore deposit at Krušná hora (fig. 2).

From graptolites limited to the horizons mentioned, only Autograptus feistmanteli Bouček was found at Drahoňa. Corystograptus retroflexus (Perner) occurs throughout the section exposed starting with the upper part of the iron ore layer. In addition, Expansograptus stanislavi Bouček was found there in association with the graptolite species mentioned (fig.1). E. stanislavi does not occur at Krušná hora, while in the lower part of the Šárka Formation at the Stanislav mine it is abundant. Besides, at Drahoňa occurs Expansograptus sp. (?sp. n.). This species is not known from any other locality.

It appears that the distribution of particular graptolite species was primarily influenced by different conditions, so that coeval graptolite associations differed in different locations within the basin.

Because of these facts we suppose that both horizons established by Bouček (1973) in the lowermost part of the Šárka Formation are of local character, and can be considered as parts of the Corystograptus retroflexus Biozone that have no wider regional value. This conclusion, together with results of J.Kraft's (1974) investigations, confirm the correctness of the existence of only one biozone in the lower part of the Šárka Formation, i.e. the Corystograptus retroflexus Biozone.

The Arenig/Llanvirn boundary

As noted by Rushton et Molyneaux (1989), the Arenig/Llanvirn boundary in the Bohemian Ordovician is not identical with the Klabava/Šárka Formations boundary, because Didymograptus spinulosus Perner and Didymograptus artus Elles et Wood occur within the Corystograptus retroflexus Biozone. The relations at Drahoňa support this concept because in a continuous section 3.3 m above the iron ore layer no pendant didymograptids were found. However, the boundary between both stages most likely falls into that part of the section which is not preserved at Drahoňa owing to the fault. The first finding of *D. spinulosus* was recorded directly above this fault.

It must be stressed that the marked interruption of *D. spinulosus* distribution (text–fig.1) most probably indicates its lower tolerance to environmental changes. Therefore, the establishment of the Arenig/Llanvirn boundary (fig.2) on the basis of the first occurrence of *D. spinulosus* appears to be problematic.

Translated by the authors
Hranice arenig–llanviri v prázdné pávní (Čechy)

Při stavbě dálnice Praha–Plzeň byl na území klasické lokality Drahůš (asi 2 km zsz. od Rokykany) odkryt vrstvení s napr. první z české lokality a spodních partií šaržeckého souvrství, včetně jejich hranice.

Klabavské souvrství tvoří jemně jilovité břidlice, které v nejvyšších polohách přecházejí do 1,9 m mocné sekvence tuftických břidlic a tuftů. V jilovitých přecházejí převážně inarticulární brachiopodi a graptolitů. Stratigraficky významné jsou druhy Tetragnostus rectus (Breidich) a Asyagnostus suecicus (Löber). V poloze tuftických břidlic se vyskytují pouze fialsítové skloky. Hranice je vyskytující se v převážně inarticulární brachiopodi.

Na hranici šaržeckého souvrství je ztvárněna 1,1 m mocná poloha celistvého užití, které vytváří právě v těchto oblastech. Místa sladnatých břidlic, jejichž šle se po 3,3 m porušeným výraznou diskolaci. Ve spodních partiích šaržeckého souvrství se vyskytují převážně graptolitů (Corymbograptus retroflexus Pernier), Algograptus cecullus (Bulman), A. feistmanteli Bouček, Exopsograptus staniolavi Bouček, Exopsograptus sp. a státního rodu Caryoceras Salter inarticulární brachiopodi. Běžný je Odontothon spargensis Obrhel. Ostatní fauna je významná.

V intervalu 6,5–5 m nad diskolaci dochází ke změně, která je charakteristická redukci počtu druhů graptolitů a snížením počtu jedinců inarticulárních brachiopodů. Nálepka se začíná běžně vyskytovat ostatní fauna (artikulární brachiopodi, měli, břichoček, ostrakodi, trobliti, kryštof a j.) a roste počet jejich druhů. Graptolithy nad ztvárněným nalézající se v převážně artikulární brachiopodi.