

CORRELATION OF THE UPPER TURONIAN FORAMINIFERAL ASSEMBLAGE FROM THE ÚPOHLAVY AND BŘEZNO SECTIONS (BOHEMIAN CRETACEOUS BASIN) WITH SOME OTHER LOCALITIES (SOUTH MORAVIA, GERMANY AND LOWER AUSTRIA)

LENKA HRADECKÁ

Czech Geological Survey, Klárov 131/3, 118 21 Praha 1, Czech Republic

(Manuscript received January 21, 1998; accepted in revised form December 9, 1998)



Project No. 362

Abstract: A correlation study was performed on the Upper Turonian foraminiferal assemblage from two localities in NW Bohemia Úpohlavý and Březno and the localities including Dresden-Strehlen in Saxony, Turolď in South Moravia and type locality of Klement in Lower Austria. The Upper Turonian sediments (Teplice Formation) from the Úpohlavý quarry and the Březno-Pd 1 borehole contained foraminiferal assemblage represented by abundant, well-preserved tests of agglutinated and calcareous species. Three levels of change of benthic foraminiferal assemblage was recognized in these sediments. The first change — the disappearance of *Cassidella tegulata* (Reuss), *Praebulimina crebra* Štemproková, *Gaudryina compressa* Akimec and *Dorothia pupa* (Reuss). At the second change *Gaudryina carinata* Franke, *Gaudryina laevigata* Franke, *Gavelinella berthelini* (Keller) and *Pyramidina kelleri* (Vasilenko) appeared. The third less significant level is characterized by the disappearance of *P. kelleri* and *G. laevigata*.

Key words: Bohemian Cretaceous Basin, Late Turonian correlation, Foraminifera.

Introduction

The Úpohlavý and Březno sections were studied during preparation of a fieldguide for the Fifth International Cretaceous Symposium in Freiberg. Micropaleontological study of the Úpohlavý section was done for the first time. Foraminiferal assemblage study of the Březno locality was done earlier by Hercogová in Macák & Müller 1968 and Štemproková in Pokorný et al. 1983. The revision of samples from Pd-1 borehole (Březno) was performed for this paper.

A substantial part of the Úpohlavý and Březno sections are formed by sediments of the Teplice Formation (Upper Turonian) with relatively abundant assemblages of benthic and planktonic foraminifers. Recently, 63 samples from Úpohlavý quarry were taken and more than 80 species of foraminifers were recognized.

Revision of foraminiferal taxonomy from 55 samples from the borehole Pd-1 (Březno) was done in order to compare the foraminiferal assemblages.

The studied localities (Úpohlavý and Březno-borehole Pd-1) are situated in the NW part of the Bohemian Cretaceous Basin which is a component of the Bohemian-Saxon Cretaceous Basin situated on the edge of the North European Platform. According Čech & Uličný (1996) and Stráník et al. (1996), these relatively shallow marine sediments of the Bohemian-Saxon Cretaceous Basin can be correlated with the autochthonous sediments covering the SE slope of the Bohemian Massif in South Moravia and Lower Austria (Fig. 1).

Hence, Dresden-Strehlen locality in Saxony (Strehle Formation) and two localities (Turolď and Klement) belonging to the autochthonous Upper Cretaceous Klement Formation

were selected for correlation study of the Upper Turonian foraminiferal assemblage from the Teplice Formation.

The Upper Turonian sediments from Úpohlavý quarry belong to limestone-marl facies of the Jizera and Teplice Formation (Čech et al. 1980). The Teplice Formation from Březno locality (borehole Pd-1) consists of dark grey calcareous claystones, marlstones and limestones. The Klement Formation from Turolď quarry and Klement type locality comprises carbonate and also pelitic-psammitic sequences. The carbonate sequence of the Turolď quarry is characterized by strong recrystallization of calcareous microfossils (Stráník et al. 1996).

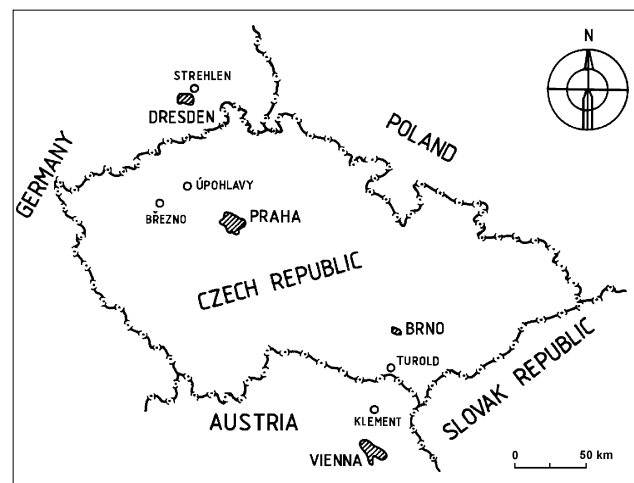


Fig. 1. Location of the studied sections.

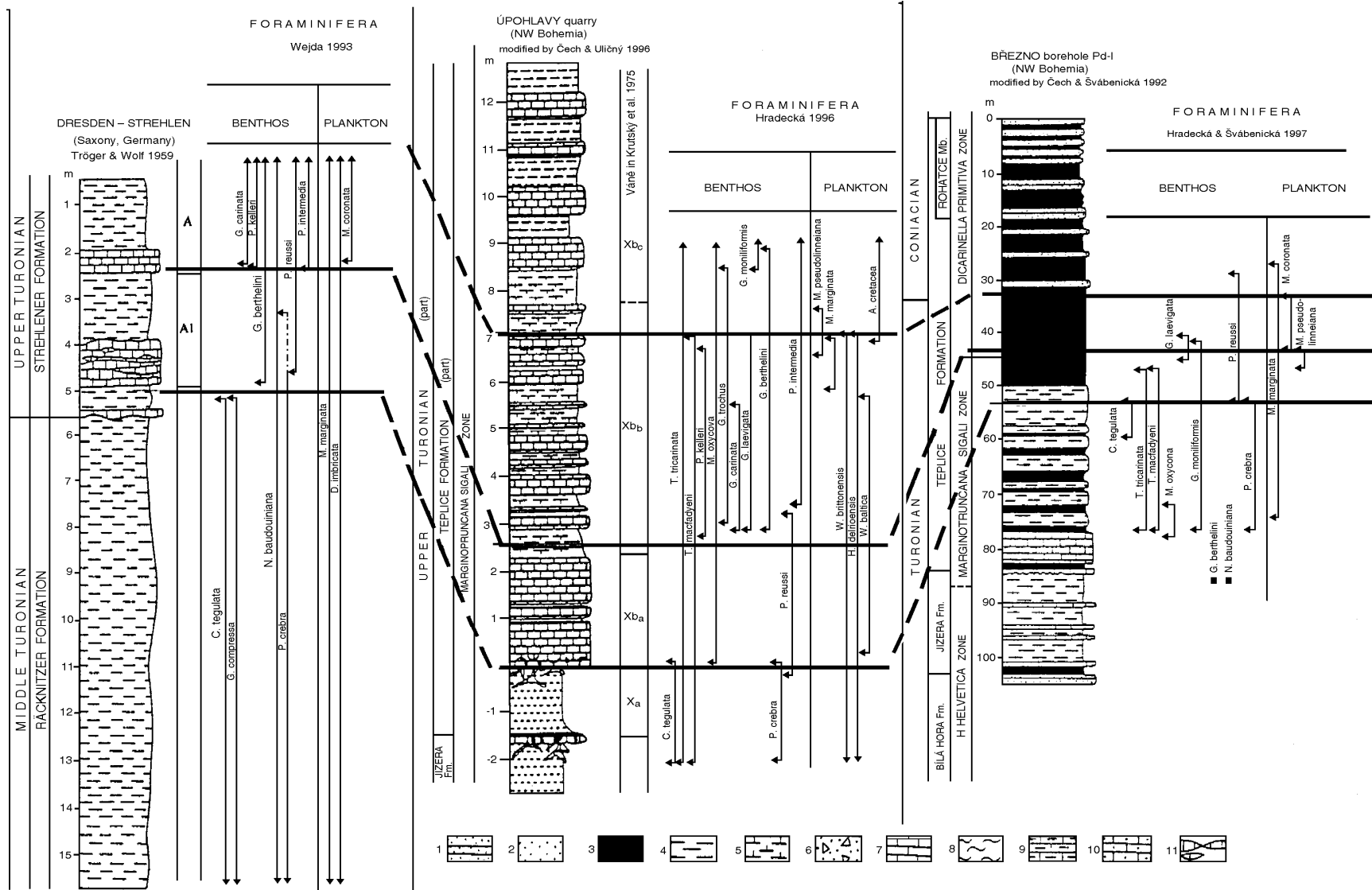


Fig. 2: The correlation of the Upper Turonian foraminiferal assemblages. 1 — sandstone, 2 — sand, 3 — calcareous claystone, 4 — marlstone, 5 — marlstone > 60 % CaCO₃, 6 — slope loams, 7 — limestone, 8 — claystone, 9 — limestone with silt and clay admixture, 10 — limestone with glauconite admixture, 11 — lenses of silicified and dolomitized limestone.

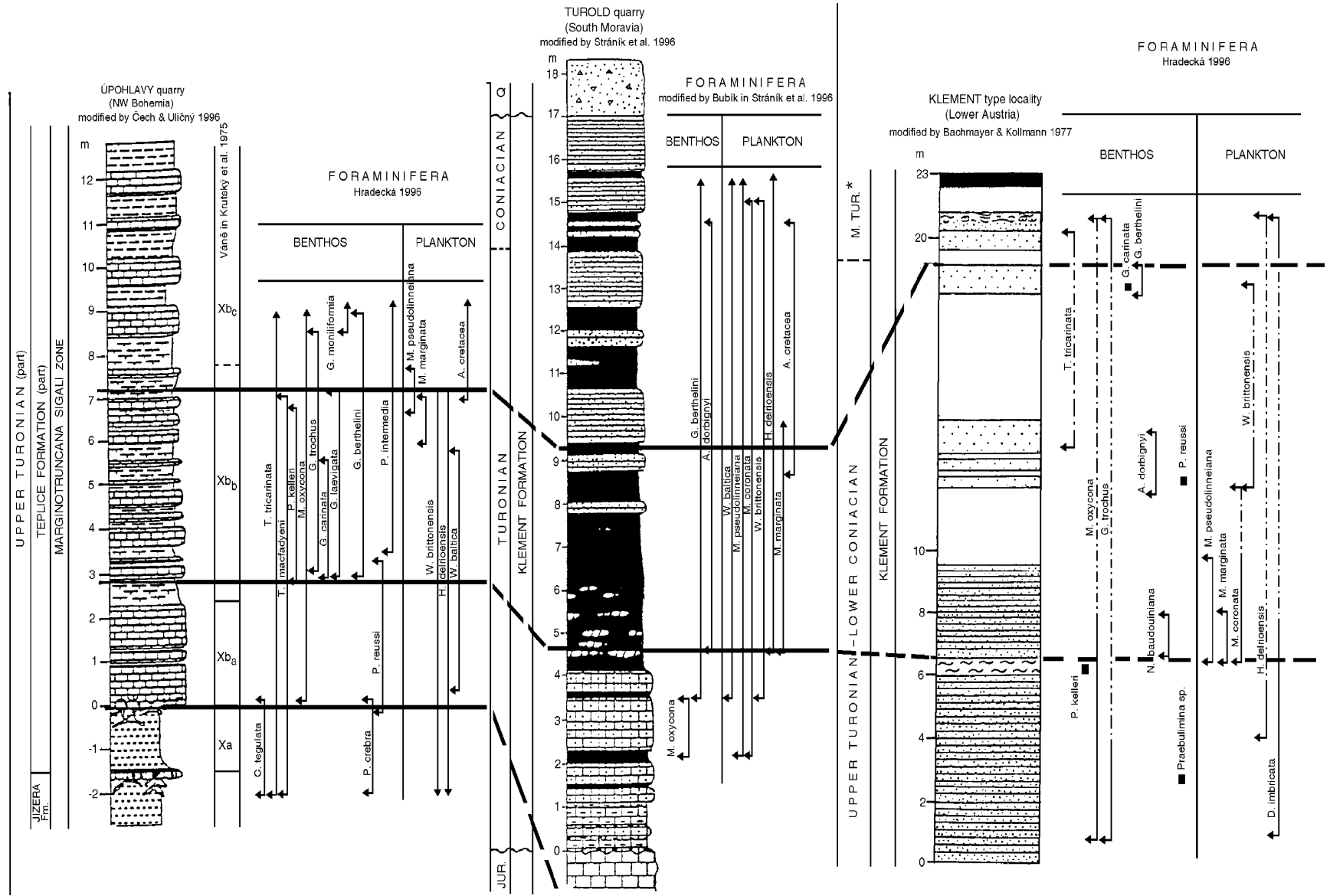
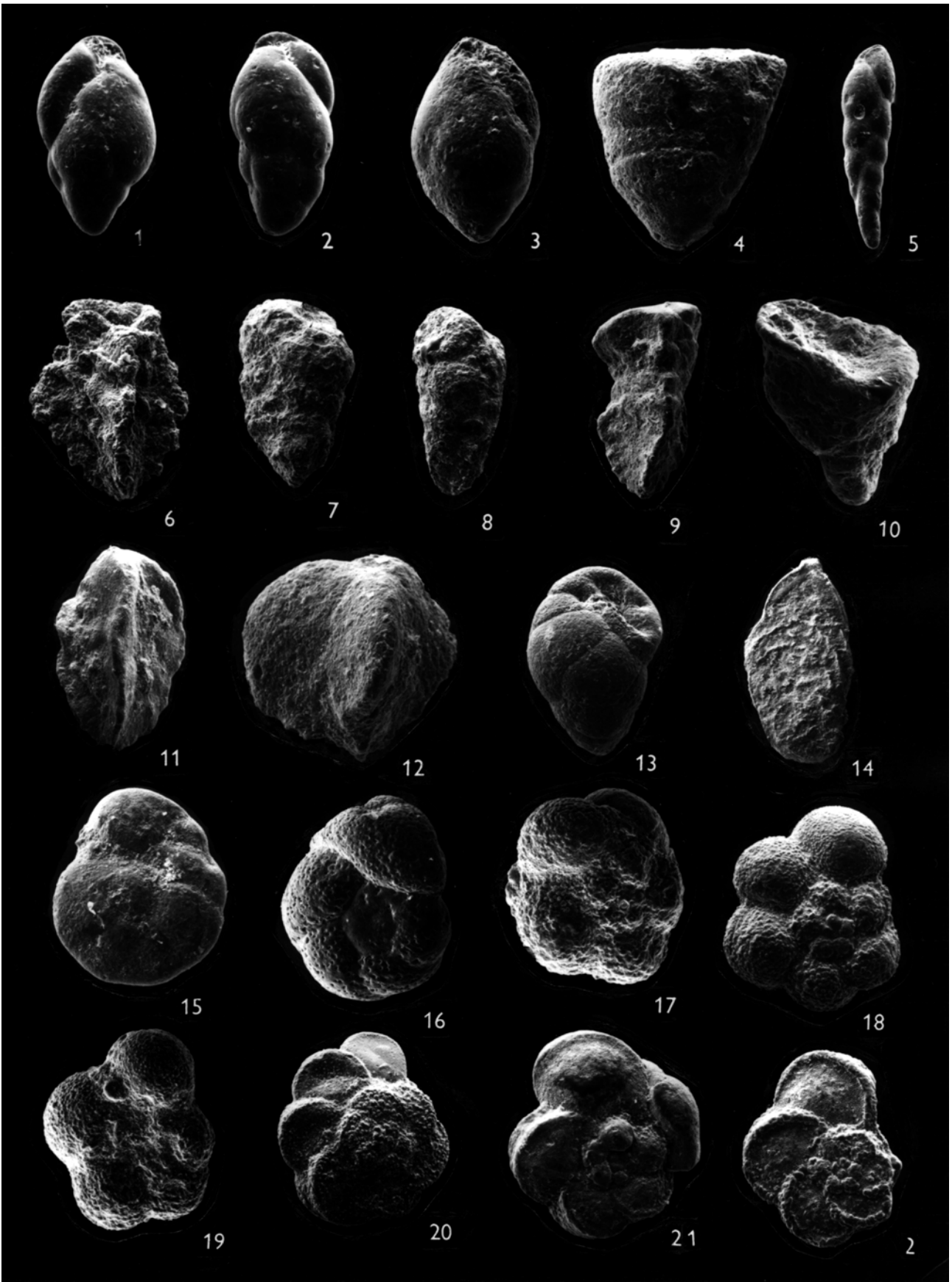


Fig. 3. The correlation of the Upper Turonian foraminiferal assemblages. * in tectonic position; for legend see Fig. 2.



Method

63 samples from the Úpohlavy section were washed in the Chemical Laboratory of the Czech Geological Survey. Foraminifers were isolated from the samples of approximately 0.5–0.7 kg of weight using the usual method of sieving through 0.063 mm sieves and silk. Foraminifers were studied using binocular light microscope. Photographs of foraminiferal species were made using SEM photomicrograph.

Foraminiferal correlation

More than 80 species of foraminifers were recognized from 63 samples taken from marlstones and limestones of the Jizera and Teplice Formations in the Úpohlavy quarry. There are three distinct levels of change of the foraminiferal assemblages (Fig. 2).

1h.i.-change: Xa/Xb.

The first change is associated with disappearance of benthic foraminifers *Cassidella tegulata* (Reuss), *Praebulimina crebra* Štemproková, *Gaudryina compressa* Akimec and *Dorothia pupa* (Reuss) at the base of the unit Xb.

Similar change was observed also in the depth about 50 m in the Březno-borehole Pd-1 where moreover the lithological change between marlstones and calcareous claystones is apparent.

This level marks the base of the foraminiferal A1 assemblage Zone of Wejda (1993) using in Saxony.

This level represents the lower part of the Teplice Formation which is well correlated with Räcknitzer Formation in Saxony. The autochthonous sediments of SE slope of the Bohemian Massif are not correlated with this level because the Klement Formation presents the upper to the uppermost part of the Teplice Formation.



Plate I: Figs. 1, 2. *Praebulimina crebra* Štemproková; Úpohlavy 1.60 m, 80×; **Fig. 3.** *Praebulimina reussi* (Morrow); Úpohlavy 2.80 m, 100×; **Fig. 4.** *Marssonella oxycona* (Reuss); Úpohlavy 4.00–4.10 m, 90×; **Fig. 5.** *Cassidella tegulata* (Reuss); Úpohlavy 1.70 m, 60×; **Fig. 6.** *Pyramidina kelleri* (Vasilenko); Úpohlavy 680–6.90 m, 60×; **Fig. 7.** *Gaudryina laevigata* Franke; Úpohlavy 3.80 m, 60×; **Fig. 8.** *Gaudryina laevigata* Franke; Úpohlavy 2.50 m, 40×; **Fig. 9.** *Gaudryina carinata* Franke; Úpohlavy 3.40 m, 60×; **Fig. 10.** *Gaudryina trochus* (d'Orbigny); Úpohlavy 4.00–4.10 m, 90×; **Fig. 11.** *Tritaxia tricarinata* (Reuss); Úpohlavy 7.00 m, 30×; **Fig. 12.** *Tritaxia macfadyeni* Cushman; Úpohlavy 7.00 m, 80×; **Fig. 13.** *Arenobulimina dorbignyi*; Úpohlavy 6.65–6.75 m, 60×; **Fig. 14.** *Neoflabellina* sp.; Úpohlavy 5.20–5.30 m, 25×; **Fig. 15.** *Gavelinella berthelini* (Keller); Úpohlavy 7.00 m, 90×; **Fig. 16.** *Gavelinella moniliformis* (Reuss); Úpohlavy 7.85 m, 80×; **Fig. 17.** *Whiteinella* sp.; Úpohlavy 1.70 m, 100×; **Fig. 18.** *Dicarinella imbricata* (Mornod); Úpohlavy 8.80–8.90 m, 80×; **Fig. 19.** *Hedbergella delrioensis* (Carsey); Úpohlavy 2.80 m, 70×; **Fig. 20.** *Marginotruncana coronata* Bolli; Úpohlavy 6.65–6.75 m, 60×; **Fig. 21.** *Helvetoglobotruncana helvetica* (Bolli); Úpohlavy 0.70 m, 70×; **Fig. 22.** *Marginotruncana marginata* (Reuss); Úpohlavy 6.65–6.75 m, 70×. Photomicrographs by Ananda Gabašová, Czech Geological Survey Prague.

Below this level (in the unit Xa), highly diversified planktonic foraminifers prevail, especially the genus *Heterohelix*. Keeled planktonic foraminifers (*Marginotruncana*) indicate relatively deeper-water conditions.

2h.i.-change: Xb_a/Xb_b.

Above the base of the Zone A1 (Wejda 1993) in the unit Xb, juvenile specimens of planktonic foraminifers prevail (e.g. *Hedbergella* and *Whiteinella*), where among purely benthic foraminifers only *Tritaxia tricarinata* (Reuss), *Tritaxia macfadyeni* Cushman and *Marssonella oxycona* (Reuss) are common in the Úpohlavy and Březno (Pd-1) sections.

Near the Xb_a/Xb_b boundary in the Úpohlavy section, another change appears comprising an abundant, highly diversified assemblage of foraminifers. The first appearance of the species *Gaudryina carinata* Franke, *Gaudryina laevigata* Franke (also in Březno-Pd-1), *Gavelinella berthelini* (Keller) and *Pyramidina kelleri* (Vasilenko) indicate the base of the Zone A of Wejda (1993), with the appearance of *G. carinata*, *P. kelleri* and *Praebulimina intermedia* Štemproková (Fig. 2). The last named has its first appearance above the Xb_a/Xb_b boundary in the Úpohlavy section. Keeled forms, such as *Marginotruncana* and *Dicarinella* dominate within planktonic foraminifers. This second change level in the Teplice Formation (Úpohlavy and Březno-Pd-1 borehole) can be correlated with the Upper Turonian sediments of the Klement Formation in South Moravia and Lower Austria (Fig. 3). In these autochthonous sediments the character of the foraminiferal assemblage is slightly different due to the Tethyan Realm. Some benthic species are missing and the diversity of the planktonic species is higher than benthic ones. But the presence of *Gaudryina carinata*, *Gavelinella berthelini* give evidence for near relations to the Boreal bioprovince. The foraminiferal assemblage from the carbonate sequence of the Turoid quarry is characterized by strong recrystallization of the calcareous tests of *Praebulimina*, *Gavelinella*, *Globigerinoides* and *Hedbergella* (Stráňík et al. 1996) and also by sandy and sandy clayey sediments of the Klement Formation in the Klement type locality which contained relatively poorly-preserved tests of the foraminifers. From the benthic species, *Marssonella oxycona* (Reuss) dominated. Planktonic species represented by genera *Whiteinella*, *Hedbergella*, *Marginotruncana* and *Dicarinella* are poorly preserved in the calcareous claystones of the Klement Formation.

3h.i.-change: Xb_b/Xb_c.

The third level of the foraminiferal changes was marked in the uppermost part of the unit Xb_b in the Úpohlavy section (Figs. 2, 3). This, not very significant level is characterized by appearance of *P. kelleri* and *G. laevigata*. This change of foraminiferal assemblage is not clearly recorded in the Upper Cretaceous sediments of the Klement type locality (Hradecká in Summesberger et al., in press) and Turoid quarry (Stráňík et al. 1996).

Only general changes of planktonic foraminiferal assemblage was observed in the studied samples. No planktonic

species important for planktonic foraminiferal zonation (Robaszynski & Caron 1995) was found, excepting *Helvetoglobotruncana helvetica*, a rare occurrence of which was observed in the lower part of unit Xb_a in the Úpohlavý section.

Conclusions

The study of the Upper Turonian sediments from the different localities enabled correlation of the foraminiferal assemblages. Sediments of the Teplice Formation from two localities (Úpohlavý, Březno-Pd-1) in the NW part of the Bohemian Cretaceous Basin contain characteristic boreal fauna. On the basis of the changes of foraminiferal assemblage, three levels are recognized within the Bohemian-Saxonian Cretaceous Basin. The rich and highly diversified

assemblage of benthic and planktonic species especially contains important benthic foraminifers from which the genera *Praebulimina*, *Gaudryina*, *Gavelinella*, *Tritaxia* etc. are characteristic.

The correlation of the localities from the Bohemian-Saxon Cretaceous Basin with the localities situated on the SE slope of the Bohemian Massif is somewhat difficult because the foraminiferal diversity is not so high and foraminiferal tests are badly preserved there. Some important benthic species found in the Teplice and Strehlen Formations were missing in the Klement Formation (Fig. 3). The sequence of the Klement Formation underlying this level could be correlated with the sequence above the boundary Xb_a/Xb_b in the Úpohlavý quarry and the Zone A of Wejda (1993). In this sequence the characteristic benthic species *Marssonella oxycona* (Reuss), *Gavelinella berthelini* (Keller) and *Pyramidina kelleri* (Vasilenko) were found (Fig. 2).

References

- Bachmayer F., Kollmann H.A., Niedermayr G., Schmid M.E. & Kennedy W.J., 1977: Beiträge zur Stratigraphie und Sedimentation der Oberkreide des Festlandssockels im nördlichen Niederösterreich. *Jb. Geol. B-A*, 120, 2, 401–447.
- Čech S., Klein V., Kříž J. & Valečka J., 1980: Revision of the Upper Cretaceous stratigraphy of the Bohemian Cretaceous Basin. *Věst. Čs. Geol. Úst.*, 55, 277–296.
- Čech S. & Švábenická L., 1992: Macrofossils and nannofossils of the type locality of the Březno Formation (Turonian–Coniacian, Bohemia). *Věst. Čs. Geol. Úst.*, Praha, 67, 5.
- Čech S. & Uličný D., 1996: Bohemian-Saxonian Cretaceous Basin — Overview. Fieldguide of the Fifth International Cretaceous Symposium, Freiberg.
- Hradecká L., 1996: Microbiostratigraphy and paleoecology of the Úpohlavý section (Late Turonian) in the Bohemian Cretaceous Basin. Abstract Volume of the Fifth International Cretaceous Symposium, Freiberg.
- Hradecká L. & Švábenická L., 1997: Microbiostratigraphy of the Jizera and Teplice Formations in the Úpohlavý quarry, Bohemian Cretaceous Basin. *Zpr. geol. výzk. v roce 1996*, Praha (in Czech).
- Krutský N., Váně M., Holá A. & Hercogová J., 1975: The Turonian and Coniacian in the lower part of Ohře river. *Sbor. Geol. Věd.*, Praha, G 27, 99–142 (in Czech).
- Macák F. & Müller V., 1968: Stratigraphy and paleogeography of the Cretaceous in NW part of Bohemia. *Čas. Mineral. Geol.*, Praha, 13, 1, 37–46 (in Czech).
- Pokorný V., Štemproková D. & Švábenická L., 1983: Loc. 33 Košnice Late Turonian, Teplice Formation. In: Samuel O. & Gašpariková V. (Eds.): 18th European Colloquy on Micropaleontology (excursion guide). *GÚDŠ*, Bratislava, 206–207.
- Robaszynski F. & Caron M., 1995: Foraminifères planctoniques du Crétacé: commentaire de la zonation Europe-Méditerranée. *Bull. Soc. Géol. France*, 166, 6, 681–692.
- Stránil Z., Bubík M., Čech S. & Švábenická L., 1996: Upper Cretaceous in South Moravia. *Věst. Čs. Geol. Úst.*, 71, 1, 1–30.
- Summesberger H., Švábenická L., Čech S., Hradecká L. & Hofmann T., in press: Stratigraphic revision of the Klement Formation (Upper Cretaceous Lower Austria, Waschberg Belt). *Ann. Naturhist. Mus. Wien*.
- Tröger K.A. & Wolf L., 1959: Zur Stratigraphie und Paläontologie der Strehleiner Schichten. *Geol.*, Berlin, 9, 288–298.
- Wejda M., 1993: Biostratigraphie und Palökologie kretazischen Foraminiferen Faunen des Ober Turon bis Unter Coniac auf dem Kartenblatt Dresden. Manuscript, Diplomarb., Bergakademie Freiberg.