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Early Cretaceous stratigraphy, palaeogeography and life in the Western Carpathians



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A contribution to
the project 362
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Abstract. Submitted work summarizes the results of lithological, lithostratigraphic, sedimentological, biostratigraphic, palaeobiological and palaeobiogeographic studies of the uppermost Jurassic-Lower Cretaceous sequences of the Outer and Central Western Carpathians, forming a part of the Slovakian, Czech (and also of the Polish) territory. Attention is paid to systematic evaluation of stratigraphically important groups of fossils, represented mainly by cephalopods (ammonites, aptychi, as well as belemnites) of which 79 species and subspecies are described in the chapter on taxonomy. The new taxa are *Lamellaptychus filicostatus fractocostatus* and *L. aplanatus latus*. The Carpathian cephalopod zonation has been checked and/or complemented by calpionellid parabiostatigraphy, which is the most useful additional tool for subdividing the uppermost Jurassic-early Lower Cretaceous deposits, where cephalopods are rare. The biostratigraphic zonation based on calcareous dinoflagellates, radiolarians, nannoplankton and planktonic foraminifers, may serve as an additional tool for more precise dating of the pelagic sequences. On the other hand, the distribution of algae, benthic foraminifers, to some extent also of brachiopods and crinoids, contributes to the dating of shallow carbonate platform deposits.

Despite occasional Early Valanginian-Late Hauterivian immigration of Boreal ammonites, the Western Carpathians belonged to the Mediterranean faunal province during the Lower Cretaceous. The periodic connection between the Mediterranean and the Boreal Realm was interrupted during Barremian times.

The majority of early Lower Cretaceous sequences is represented by the so-called Neocomian facies. Elevations produced by Late Hauterivian and Barremian tensional stress are characterized by organogenous "Urgonian" limestone, that is carbonate platform sediments, while argillaceous deposits similar to black shales prevailed in rifted basins. Carbonate platform sedimentation ceased during the Middle Albian "collapse" of the area. Later on, pelagic shales passing upwards into flysch deposits prevailed in all basins.

■ *Early Cretaceous, Cephalopoda, taxonomy, microplankton, associations, biostratigraphy, lithostratigraphy, palaeogeography, Western Carpathians, Czech and Slovak Republic.*

Zusammenfassung: In der vorliegenden Arbeit werden die Ergebnisse lithologischer, lithostratigraphischer, sedimentologischer, biostratigraphischer und paläobiogeographischer Studien der höchsten Jura-Unterkreide-Schichtfolge der Äußeren und Zentralen Westkarpaten zusammengefaßt, die in Slowakien, Mähren wie auch Polen auftreten. Aufmerksamkeit wird der systematischen Auswertung der stratigraphisch wichtigen Fossilgruppen gewidmet, die vor allem durch Cephalopoden (Ammoniten, Aptychen und Belemniten) vertreten sind, von denen 79 Arten und Unterarten beschrieben werden. Neue Taxa sind *Lamellaptychus filicostatus fractocostatus* und *L. aplanatus latus*. Die karpatischen Cephalopoden-Zonen wurden überprüft und durch die Calpionellen Parabiostatigraphie ergänzt, die eine sehr wertvolle Hilfe für die Einstufung der Sedimente des höchsten Jura und der frühen Unterkreide darstellt, in denen Cephalopoden-Überreste selten sind. Die auf kalkigen Dinoflagellaten, Radiolarien, Nannoplankton und planktonischen Foraminiferen basierende biostratigraphische Zonierung eignet sich möglicherweise für eine genauere Datierung der pelagischen Folgen. Andererseits können mit Hilfe der Algen, benthischen Foraminiferen und teilweise auch der Brachiopoden und Crinoiden die Sedimente der seichten Karbonatplattform besser untergliedert werden.

Obwohl vom frühen Valangin bis zum späten Hauterive gelegentlich boreale Ammoniten auftreten, gehörten die Westkarpaten während der Unterkreide zur mediterranen Bioprovinz. Die periodische Verbindung zwischen dem mediterranen Gebiet und der borealen Region wurde während des Barreme unterbrochen.

Die meisten Sedimentabfolgen der frühen Unterkreide liegen in der Neokom-Fazies vor. Die im höheren Hauterive und Barreme durch Dehnung verursachten Hebungen sind durch Plattformsedimente in Form organogener Kalke ("Urgon"-Fazies) charakterisiert. In den Gräben überwiegen hingegen tonige Sedimente, die Schwarzschiefer-

Charakter besitzen. Nach dem Zusammenbruch der Karbonatplattformen im mittleren Alb überwogen im ganzen Becken pelagische Schiefer, die ins Hangende in Flysch-Ablagerungen übergehen.

■ *Unterkreide, Cephalopoden, Taxonomie, Mikroplankton, Assoziationen, Biostratigraphie, Lithostratigraphie, Paläogeographie, Westkarpaten, Tschechische und Slowakische Republik.*

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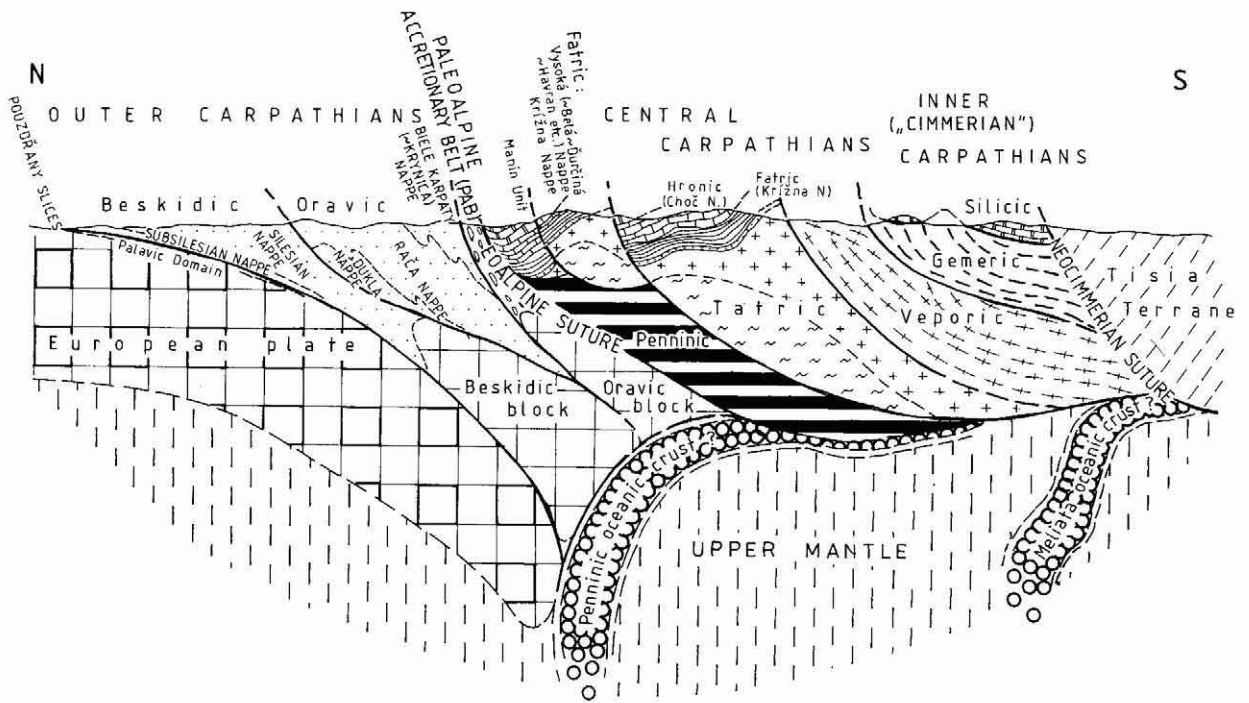
1 Introduction

The Western Carpathians, forming a part of the Alpine Orogenic Belt, represent the western segment of Carpathian Mountain Range, pushed far to the north along the boundary with the Bohemian Massif. Their complex nappe structure, created and controlled by the Palaeoalpine and Neoalpine orogenic phases stimulated numerous discussions concerning both mutual position of nappe units and localisation of their "root zones", or the palinspastic reconstructions in general.

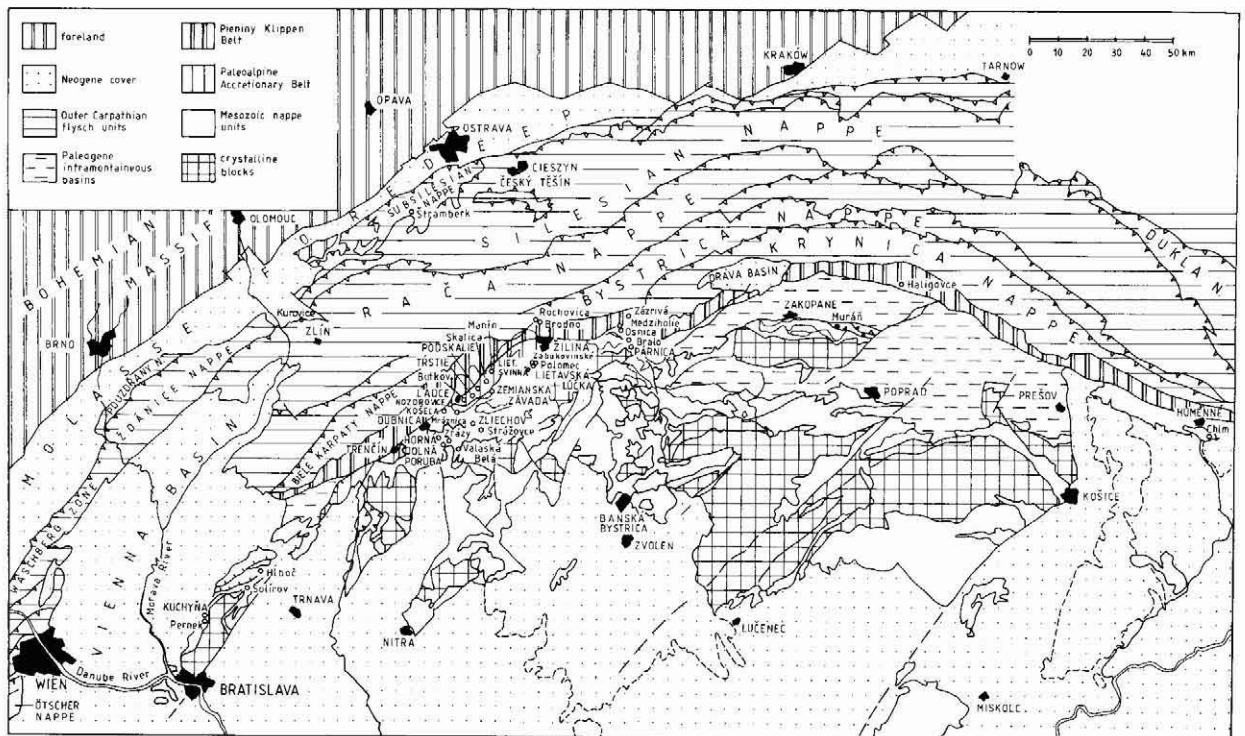
Considerable shortening of the former sedimentary basins by the Alpine tectonic processes (comprising subduction, nappe movements, rotation of blocks and/or strike slipping) attained many hundreds of kilometers. ANDRUSOV (1959) supposed original width of the Mesozoic West Carpathian Mobile Zone as 360, later (1968) even 600 kilometers. MAHEL (1978) estimated this width as 450-500 km. MIŠÍK (1978) considered that only Late Jurassic Klippen Belt basins

had to be at least 350 km wide. KRS & ROTH (1979) on the base of the palaeomagnetic data calculated the width of the Western Carpathians as 1200-1300 km. According to the BIRKENMAJER's (1986) Aptian/Albian palaeogeographic scheme, the belt between the outer margin of the Silesian Unit and the exotic "Andrusov Ridge" rimming the Penninic Oceanic Zone was 900 km wide.

Principal division of the West Carpathian Mesozoic sedimentary basins has been discussed by MAHEL (1986), BIRKENMAJER (1986), MICHALÍK & VAŠÍČEK (1989), MICHALÍK & SOTÁK (1990) and by other authors (Text-fig. 1). Until the Late Cretaceous, this domain consisted of two independent areas: Outer and Central Carpathian blocks, respectively. The Outer Carpathian area (consisting of the Palavic, Beskydic and Oravic Belts according to MAHEL 1986) formed the foreland of the Bohemian Massif shelf. Several



Text-fig. 1. Schematic cross-section through the Western Carpathians illustrating their principal structural division and nomenclature.



Text-fig. 2. Principal tectonic units of the Western Carpathians and localization of the main Lower Cretaceous complexes and sections studied.

