

## Lithology of Lower Cretaceous “Urgonian” Carbonate Platform Facies in the Manín Unit (Western Carpathians)

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The term “Urgonian facies” refers in the Western Carpathians to massive organodetrital limestone with Upper Barremian–Aptian fossil remains. From bioclasts, fragments of rudistid bivalves, echinoid particles, foraminifers (*Palorbitolina lenticularis*, *Sabaudia minuta*), coralline algae, bryozoans, fragments of hydrozoa are most characteristic. Their occurrences in the Western Carpathians were processed and summarized by Mišík (1990). During the Barremian–Aptian a carbonate platform evolved near the northern margin of the Central-Carpathian Block in accordance with the widespread platforms of Urgonian type in Tethys realm. Two centres can be traced in Western Carpathians: the Tatric Urgonian platform (biohermal and lagoonal facies), from where detritus was transported into the Muráň limestone and the Manín Urgonian platform prograding into Belá succession during Aptian. Debris from both centres was transported into adjacent basins and laid down as allodapic accumulations.

The Manín Unit is originally Central Carpathian unit which has become a part of accretionary prism in the front of Central Carpathian block. It was incorporated into the region of the Pieniny Klippen Belt. It was deformed during the younger phases of the Alpine Orogeny together with the Outer Carpathians.

In the Butkov Quarry a sequence of the Lower Jurassic and Lower Cretaceous beds of Manín Unit was exposed. Urgonian complex consists of the thick bedded Podhorie Formation and of the massive Manín Formation. The Podhorie Formation consists of Barremian to Lower Aptian organodetritic as well as micritic limestone with chert, rarely with fragments of basic extrusive rocks. The formation reaches thickness of 65 – 75 m. Upwards they pass into the carbonate platform limestone of the Manín Formation. It is developed in complex of mainly gray to light gray massive organogenic limestone with numerous Aptian to Albian fossils: foraminifers (*Orbitolina*), crinoids, echinoids, molluscs, ostracods, corals and calcareous algae. Total thickness of the formation attains around 50 meters. The Manín Formation is terminated by hardground surface, which is followed by deep-sea clay sediments of the Albian - Cenomanian Butkov Formation (Borza *et al.*, 1987). This “Urgonian” carbonate complex of biodetritic and biogenic limestone of shallow-sea carbonate platform origin gradually covered the basal deposits of the region. In the Butkov area, the major part of these carbonates is developed as the carbonate platform facies and its slope (Michalík *et al.*, 2005).

Urgonian limestone in the Manín Straits represents a typical member of the bed sequence of the Manín Unit (Mišík, 1990). Only

Barremian strata are represented here, upper part of the sequence was eroded before Albian. The limestone is massive organogenic to gravelous, in the uppermost parts rudist (only fragments) limestone occur and look like from reef core being bioclastic without corals and terrigenous admixture. Thickness of the limestone reaches 90 m.

The “Urgonian” facies of the Skalica Klippe near Dolný Moštenec village (Strážovské Vrchy Mts.) is represented by coarse-grained carbonate conglomerates and breccias about 17 m thick, composed of “Urgonian” limestone clasts (Michalík *et al.*, 1984). Several cycles have been recognized within the sequence. The stratigraphical range from Middle Aptian to the boundary Aptian–Albian was ascertained with microorganisms and two cephalopod horizons. The sequence is overlain by dark Albian limestone with chert. All pebbles as well as angular clasts within the “Urgonian” facies belong to Barremian–Aptian rocks, mainly typical “Urgonian” organodetrital limestone considered as debris flows in channels on the foot of steep submarine elevation.

Nížná limestone is related to the Manín Unit folded later into the Pieniny Klippen Belt (Orava area) (Mišík, 1990). It is composed of Barremian–Aptian organodetrital limestone. The basal part contains breccia with the fragments of Upper Jurassic–Lower Cretaceous limestone, black chert and marl. This “Urgonian” limestone locally contains brownish chert, too. Associations of bivalves, echinoderms, agglutinated foraminifer (*Hedbergella*), echinoid spines and coralline algae are the most frequent. Estimated thickness reaches 10 m.

The Haligovce Klippe is usually considered as an equivalent of the Manín Unit (Birkenmajer, 1977). This limestone of “Urgonian” type is 40 m thick. Its lower part is formed by bituminous, thick bedded limestone with chert, the upper part of the sequence is formed by light-grey massive organodetrital limestone with pelecypod detritus, fragments of foraminifers (*Orbitolina*), plates of echinoderms and scarce bryozoans.

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