

OXFORDIAN CARBONATE DEPOSITS IN UKRAINIAN PRECARPATHIANS

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Abstract: Oxfordian sequence in Ukrainian Precarpathians is the genetic interconnected deposits from lateral succession of carbonate shelf facies and its periphery. In these sequence structure are singled out the beds, which correspond the tracts – transgressive (Early Oxfordian), high standing (Early-Late Oxfordian), low standing (the end of the Late Oxfordian).

Key words: sequence, reef facies, substitution, thickness, sedimentation factors.

In the western region of Ukraine the Oxfordian deposits are uncovered by numerous wells. According to the last stratigraphic scheme [1] the Oxfordian deposits in the Precarpathian region are estimated as the composition of three formations: Rudky – bioherm formations, Boniv – the formations of the open sea in the deepened shelf zone, Sokal – the deposits of littoral-marine shallowness (Early Oxfordian), lacustrine – marsh – alluvium (Middle Oxfordian), lagoonal – continental (Late Oxfordian). The studies conducted on the basis of sequence stratigraphy methodological positions allow us to consider the Precarpathians Oxfordian carbonate deposits as the common sedimentary complex. The genetic interconnected rock masses lateral succession of carbonate shelf facies and its periphery reshape in the composition of this Oxfordian sequence. The results of lithologic-facial and biostratigraphic investigations allow us to define in the structure of Oxfordian sequence reefogenic facies (fore-reef rock mass corresponds with Boniv fm, reef and back-reef rock-mass are fixed in the Rudky fm composition), which are replaced by littoral-marine deposits of the Sokal fm in the periphery of the basin. These facies strike sub-meridionally and their substitution take place from deep-water in the west up to shallow in the east. The carbonate facies are drilled by wells only in the north of the region. In the south the Oxfordian reefogenic facies are overlapped with the Carpathians thrust structures (fig. 1). The thicknesses of the Oxfordian rock masses reach 200 m and more in the reef-front belt (in the west) and gradually decrease in a direction to periphery (the deposits are wedging out in the east). The reefogenic facies lie the Middle Jurassic deposits and the littoral – predominantly on the Paleozoic. In the top of carbonate complex is fixed the marker horizon, which is called by geologists “variegated”. The Oxfordian deposits are overlaid with the Kimmeridgian formations and in some places with Neogene.

Reef facies. The Oxfordian reef belt is traced as a submeridional strip of width up to 80 km and more. The thicknesses on the average are up to 100 m and in the bioherm zone – up to 120–140 m and increase in direction to the edge of shelf. Four bioherm domes are determined by drilled sections on the areas: Podlubny, Rudky, Mosty,

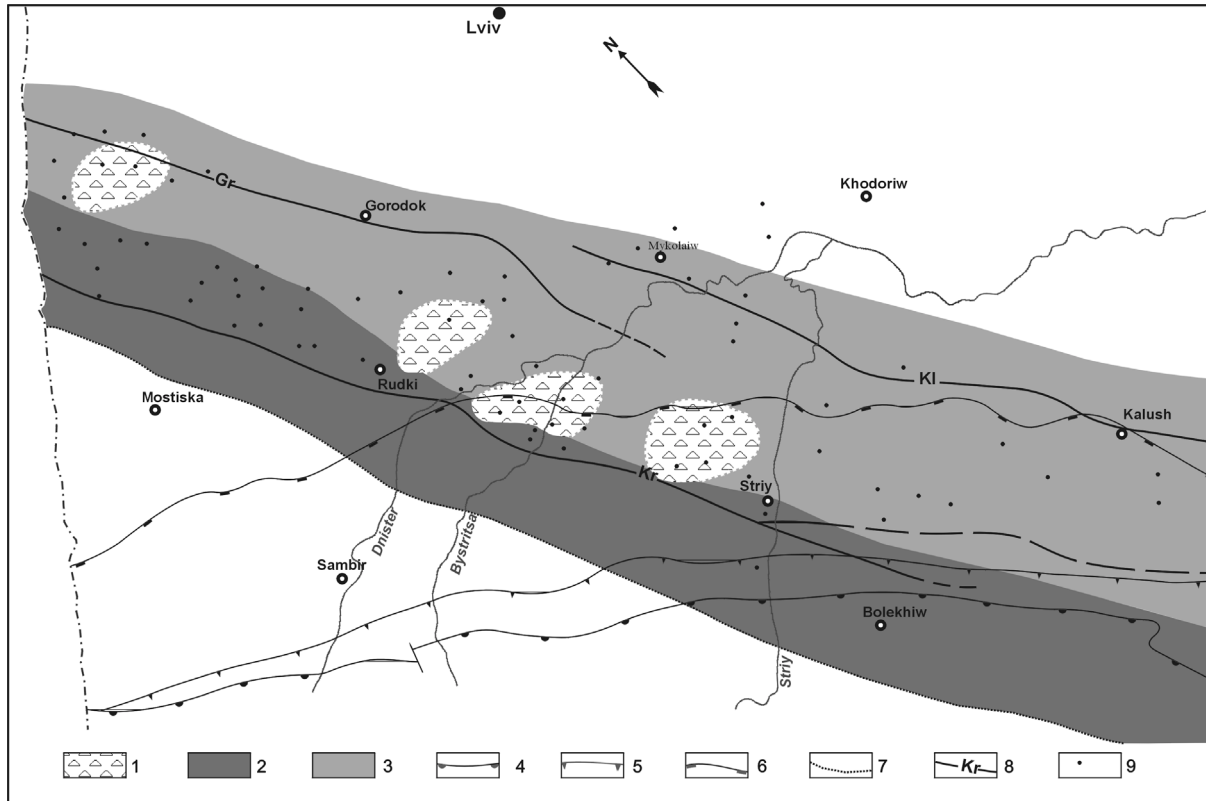


Figure 1. Lithofacial map of Oxfordian deposits in Ukrainian Precarpathians

1- reef facies; 2 - fore-reef facies; 3 - back-reef facies; 4-6 - Carpathian trust structures; 7 - overlapped Lezhayskaya structure; 8 - regional faults: Kr-Krakowetsky, Gr-Gorodoksky, KI-Kalushsky; 9 - well

Podoltsy, Northern Medynychi (see fig. 1, 2). These domes are formed by the same type section: (from below to top) up to 20 m – limestones grey and dark grey sandy; up to 60 m – limestones bright-and-dark grey with brown, cream, green tints, spicule and spicule-sterraster interbeds of silicons, spongolites, dolomites; up to 40 m – limestones grey and bright-grey, cream organogenic-detrital and cryptocrystalline, cavernous, contain corals, sponges, bryozoans, algae; interbeds of algal, oolitic, pseudoolitic limestones and dolomites; up to 20 m – limestones light-grey and cream pseudoolitic and oolitic, in some places pelitomorphic and fine-grained. The lower group of stratas of limestones are frequently dolomitic and silicated. As a whole in the section is characteristic partial rocks brecciation, the interbeds of limy conglomerates and breccias calcareous argillites and aleurolites. On the places between bioherm the deposits thicknesses gradually decrease till 40-60 m, the rocks are enriched with terrigenous component and are represented by grey and light-cream sandy limestones, which contain spicules and sponges sterraster, with interbeds of limy breccias, in some places

– aleurolites. The deposits contain solitary Oxfordian foraminifera – *Mesoendothyra iziumiana* Dain, *Trocholina belorussica* Mitjan, *T. transversarii* Paalz, *Ammobaculites coprolithiformis* (Schwager) and others.

Fore-reef facies. The formations of the shelf frontal slope are substituted the reef rock masses in the western direction. Fore-reef belt runs as a narrow strip up to 12 km of maximum width. The thicknesses 50-150 m increase in the western direction. The section as a whole is formed by interbedding of limestones and argillites, in some places with interbeds of marls, aleurolites, sandstones, silicons, gravelstones and breccias of slight thickness. The rocks are light-and-dark grey, in some places with brown and green tints. The limestones and marls are clayey, aleuritic, sandy, in some places brecciated. Argillites and aleurolites are micaceous, calcareous. The sandstones are quartzitic, calcareous. The breccias and gravelstones are composed of limestones and argillite debris and calcareous cement. The rock mass has the features of frontal slope deposits: the bedded fine-grained deposits with sliding textures, fragmental rocks and the mass of calcareous ooze. The material for the suite formation were the fragments of reef body rocks which contain the foraminifera of Oxfordian – *Trocholina belorussica* Mitjan, *T. transversarii* Paalz, *Marssonella doneziana* Dain and other. The fine-grained deposits contain remains of planktonic organisms, among which one meets *Globugeria oxfordiana* Grig. of the Oxfordian age.

Back-reef facies. The deposits of reef belt are substituted in the east by a back reef rock mass, which runs as a submeridional strip of 5–10 km width and which increases in the north. The thicknesses from 60–100 m in the west decrease till 8–10 m in the east. In the back zone by the bioherms – the deposits are represented with organogenic limestones, which are substituted by organogenic – fragmental, cryptocrystalline, pseudoolitic and oolitic limestones, in some places by dolomites at approaching the shallowness. The limestones are grey, dark-grey, in some places with cream tint. At nearing to the basin periphery the rock mass is enriched by a terrigenous component and contains interbeds of argillites. This deposits were formed in the conditions of open, gentle carbonate shelf and characterized by a variety of structures and wide development of oolitic limestones. The rocks are impoverished of microfauna, the existence of which did not favour the conditions of mobile substratum.

Littoral-marine deposits. The deposits of littoral zone are drilled only in the north easternmost part of the region (the areas of Rava-Ruska and Velyki Mosty). The rock mass thicknesses are 10-24 m. The section consists of limestones cream-grey, sandy, in some places brecciform, which in the top are substituted by calcareous aleurolites

with interbeds of gravelly sandstones and argillites. The clastic rocks are grey and dark-grey, micaceous, bedded. Limestones and argillites contain a complex of foraminifera –

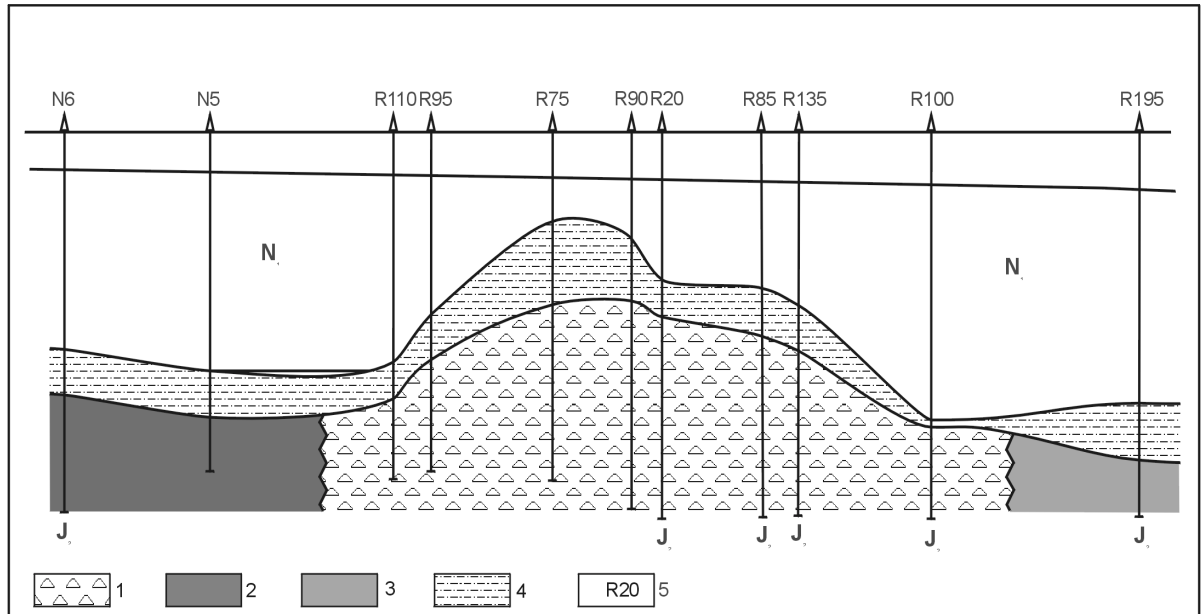


Figure 2. Lithofacial profile through Oxfordian bioherm

1- reef facies; 2 - fore-reef facies; 3 - back-reef facies; 4 - "variegated" horizon; 5 - well

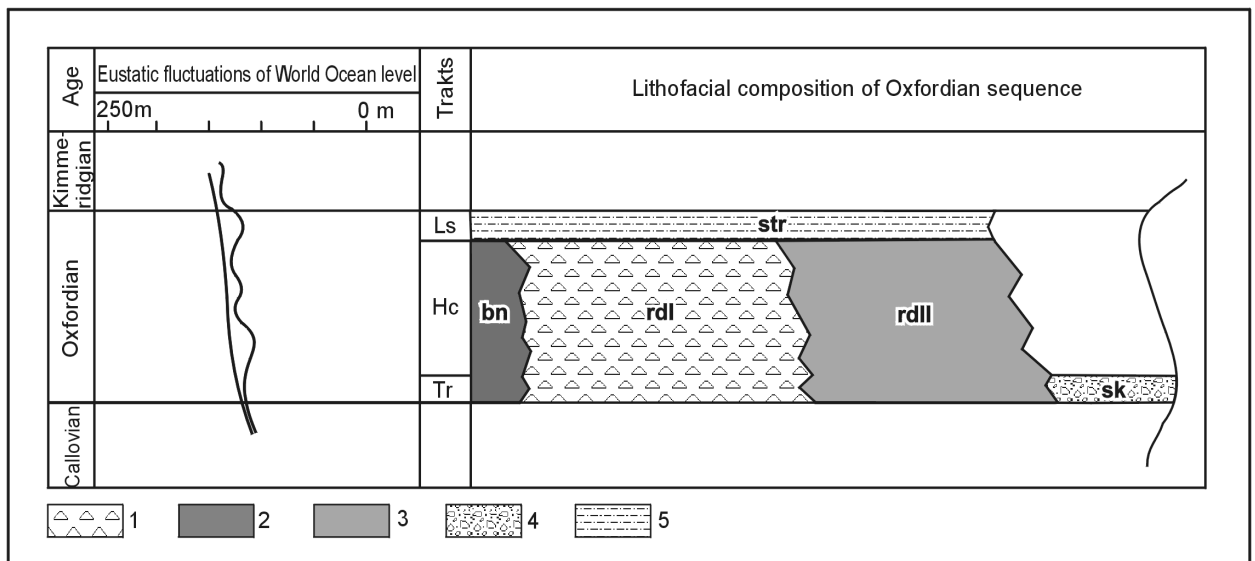


Figure 3. Lithofacial scheme of Oxfordian carbonates in Ukrainian Precarpathians.

1- reef facies; 2 - fore-reef facies; 3 - back-reef facies; 4 - littoral-marine facies; 5 - "variegated" horizon

Haplophragmium coprolithiformis Schwager, H. suprajurassium Schwager, Bulbobaculites maynci Bizon, Pseudocyclammina sequana minor Mohler, Discorbis speciosus (Dain), Trocholina belorussica Mitjan., T. nodulosa Seibold, Paalzowella turbinella (Gumb.), P. feifeli feifeli Lutze, Spirothamidium dilatatum (Paalzow), Marssonella jurassica Mitjan., which indicate on the Early Oxfordian age of deposits.

The geologists single out the «variegated» horizon in the top of Oxfordian deposits. Reefogenic facies are overlapped by diverse rocks – grey, light-and-dark grey, frequently with green, brown, yellow, ochreous spots, in some places with blue, green, brown tint, in some areas – brown-red, cherry, ochreous argillites, clays, sandstones, marls, dolomites, sometimes with anhydrites inclusions. The ratios of these rocks in the section are not sustained. The thicknesses from 20 m above shallow limestones increase up to 45 m at bioherm tops, where augments the significance of brecciform limestones. In the whole the horizon is characterized by brecciation and crumpling of rocks. Above the reef-front facies these deposits are made up of grey, dark-grey, green-grey argillites and limestones with interbeds of marls, aleurolites, sandstones. Carbonate beds in the structure of this horizon contain foraminifera *Haplophragmium coprolithiformis* Schwager, *Mesoendothyra izjumiana* Dain, *Pseudocyclammina sequana minor* Mohler, *Pseudocyclammina ukrainica* Dain, *Everticyclammina virguliana* Koechlin, *Choffatella tingiana* Hottinger, which are characteristic for the upper parts of the Oxfordian and lower parts of Kimmeridgian. The formation of this horizon took place in shoaly, often subaerial conditions of retreating sedimentation.

Oxfordian sequence is characterized by the indications of shoaling up the section. Oxfordian rock masses forming began from the early Oxfordian transgression and Early Oxfordian littoral-marine deposits were formed on the basin periphery. The transgressive beds enriched with a clay material and sandy component are fixed in the bottom of carbonate facies. The bioherms are formed with spongeous limestones which above are substituted by limestones with the corals and algae and in the top lie oolitic limestones group of strata. This testifies about the regressive background of bioherm bodies sedimentation. The sponges with siliceous skeleton formed bioherms in the beginning of the Oxfordian on the more deep-water shelf slope. About rather deep-water character of the hills lower group of strata sedimentation testifies also often rocks silification. Later as a result of regression the spongeous hills were populated with corals and algae, which moved here from the more shoaly zones of basin. In the Upper Oxfordian deposits the regression is expressed in oolitic limestines group of strata forming in the bioherms top. The oolitic limestones substitute also near-reef limestones in the top of back reef rock mass. The maximum of regression fixes the “variegated horizon” in the top of the Oxfordian carbonates.

Thus, in the Oxfordian sequence structure are singled out the beds, which correspond the tracts – transgressive (Early Oxfordian), of high standing (Early – Late Oxfordian), of low standing (the end of the Late Oxfordian). The Oxfordian sequence

forming is stipulated by the eustatic fluctuations of the World ocean level (fig. 3). Our studies have shown that the Oxfordian deposits sedimentation factors are analogous to the sedimentary tendencies of the whole Tethys paleobasin.

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