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LITHOLOGIC-STRUCTURAL FEATURES OF THE SECTION OF UPPER CRETACEOUS–PALEOGENE BOUNDARY IN THE PARASKA THRUST SHEET REAR PART (KOROSTIV-VILLAGE AREA)

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The new data on the lithological composition of layers from the Upper Cretaceous–Paleogene contact zone in the flysch strata, which is exposed in the rear part of the Paraska thrust sheet (left side of the Oriava-river, north-eastern outskirts of the Korostiv-village, Skole district, Lviv region), are given. Because of large-scale mapping, the ratio of individual layers of the section was analyzed and the structural features of this contact zone were determined. In general, the section reflects the structure of imbrication caused by lit-par-lit sliding of the layers. The section is complicated by a low-amplitude steep-inclined left-sided strike-slip fault. We associate the lithological composition and the facial variability of deposits with the conditions of sedimentation, as well as the longitudinal and transverse tectonic zoning of the trough basin.

Key words: Paraska thrust sheet, strike-slip fault, structure of imbrication, flysch deposits, Ukrainian Carpathians.

Introduction. Flysch deposits of the Skybovyi nappe in the Ukrainian Carpathians are allochthonous, they have been moved to the place of their current occurrence from the southwest to a distance of at least 15–20 km, possibly, much more [2]. The relevance of the work is due to the fact, that the position of the Upper Cretaceous–Paleocene age boundary in the stratigraphic section in various parts (front, rear) of the thrusts in Skybova zone has not yet been finally determined. According to L. Portniahina (1981), the age boundary Cretaceous–Paleocene does not pass at the sole of the Yaremchanskyi horizon, as previously thought, but a little lower, in the deposits of the Stryiska suite and only somewhere coincides with the sole of the Yaremchanskyi horizon deposits [5].

Formulation of the problem. During our own field research (2014–2018) and the study of the lithology of rocks in thin sections, as well as due to the experience of previous researchers, we received new data on the lithological composition of the Upper Cretaceous–Paleocene deposits in the outskirts of the Korostiv-village.

The investigated section, previously studied by the geologists from expeditions (G. D. Dosin, 1970), is located in the rear part of the Paraska thrust sheet on the northeastern outskirts of Korostiv-village, Skole district of Lviv region [2].

Stryiska suite (K_2–P_1st) on the explored territory is represented by the powerful flysch strata, which is a significant part of the section of Skybovyi and Boryslavsko-Pokutskyi nappes. This strata was accumulated in deep-water conditions of the tectonic-active orogenic belt due to turbid currents or streams of partially sparse sedimentary matter. Therefore, these deposits are generally characterized by abrupt vertical and lateral changes of lithotypes.

The purpose of the research is to study the correlations of certain layers of the section and to determine the structural features of the contact zone between the flysch deposits of the Upper Cretaceous and the Paleogene in the left side of the river Oriava.

Research methods: large-scale mapping, petrographic research.

Presenting of main material. In the approved stratigraphic scheme, the Stryiska suite is divided into three members. However, such a division is subjective, since the lithological composition of the suite within the entire Carpathians is very diverse and varies in time and space, but there are no reliable criteria for the division of the suite [5].

The deposits of the Stryiska suite can be traced on the surface in the form of stripes, which are the front parts of secondary thrust structures (scales etc.). The representative sections of the suite are exposed along the valleys of numerous rivers and opened up by quarries in the area of the villages of Sviatoslav and Hrebeniv. At depth, they are drilled by wells. The lower part of suite section is almost everywhere cut by a thrust. The rocks that superpose the thrust-fault plane are represented by thin-layer interstratification of gray calcic sandstones, aleurolites, occasionally limestones and marls. The series of a coarse-rhythmic flysch, in which thick-bedded sandstones dominate, overlays them. Non-rhythmic interstratification of gray calcic sandstones, aleurolites, argillites with lens-like layers of limestones and marls finishes the section of the suite. The boundaries between all parts of the suite are diachronous. Somewhere in the section, small-thick packages of colourful clays can be traced, but they quickly disappear along the strike. Colourful Yaremchanskyi horizon of the Paleocene overlaps the suite [6].

We studied the natural outcrop of flysch rocks of the Yaremchanskyi horizon lower part in the left side of the Oriava-river, 15 m high and 150 m in length (Fig. 1). The rocks are thin-laminated. The thickness of sandstones packets is 10–30 cm, argillites – up to 1 m. We performed detailed investigations of the rocks of this part of the outcrop to determine the characteristics of their mineralogical and faunal composition.

The rocks are represented by sandstones – inequigranular, gravelly, and polymictic. Among the debris are siliceous rocks, quartz and K-Na feldspars; authigenous carbonate occurs. Cement of basal type is argillaceous-carbonate with chlorite.

Limestones are inequigranular, organogenous-detrital. The texture is coarse-medium-detrital: in the medium-fine-grained (0.30–0.01 mm) detrital groundmass, there are large (2–3 mm) foraminifera and red algae. Limestone is composed of organogenic detritus (60–70 %), authigenous calcite (10–15) and sandy-silty admixtures (15–20 %). Fossils remains are debris of lithothamnium – coralline algae (10–15 %), benthic foraminifera (5–10) and spicules of brachiopods (1–5 %). Skeletal parts of lithothamnium algae (apparently, the genera Lithothamnium, Archaeolithothamnium, Amphipora or Lithophyllum) have tubular shapes, they are located in parallel, densely packed and calcitizated. Concentric surfaces of growth are present in the cross-section of algae.

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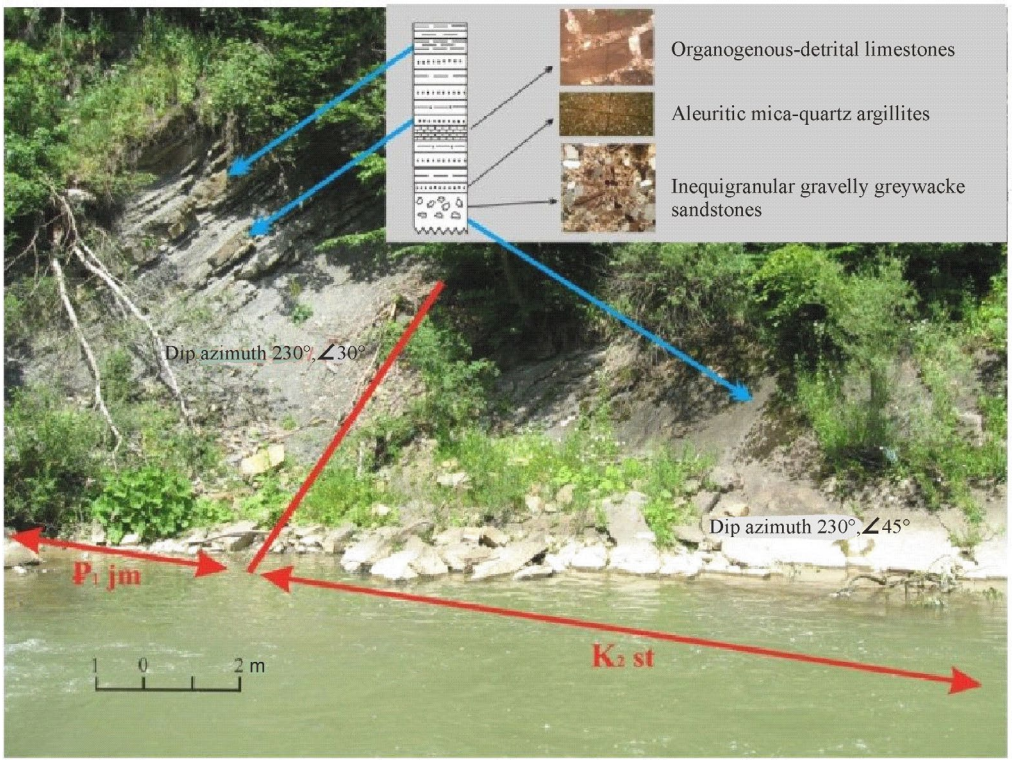

Fig. 1. Lithologic-stratigraphic column of Cretaceous–Paleocene rocks (Oriava-river) and lithologic features of the rocks of the Stryiska suite (dip azimuth 230°, ∠ 45°) and the Yaremchanskyi horizon (dip azimuth 230°, ∠ 30°).

The size of the lithothamnium algae fragments is 1.1–1.4 mm. Foraminifera are fragments of shells of the size of 0.7–1.0 mm. Their walls are massive (0.01–0.03 mm), light brown, micro-grained. Shell cameras are usually empty, only occasionally carbonate minerals fill them. The rocks often contain altered remains of the paleofauna, paleophlora, and glauconite, which grains are partially replaced by hydromica and chlorite.

Argillites are aleuritic, homogeneous, have pelitic, rarely aleuro-pelitic texture, composed of almost isotropic kaolinite with an admixtures of hydromica and chlorite.

Consequently, gradual natural changes in the composition of rocks have been revealed – from gravelly carbonate sandstones of the Stryiska suite and aleuropelites to organogenic-detrital limestones in the so-called transition zone.

Downstream from the described outcrop, during 400 m along the river Oriava and on both its sides, we fixed a change in the occurrence of sandstone layers of the Verkhniostryiska member: for a steady dip azimuth of 230° the angle of gradient of sandstone and aleurolite layers varies from 30 to 45°. According to the characteristic textures of A. Bouma's cyclite, it is determined the overturned bedding of some layers, and the angle of gradient of these layers reaches 60° (Fig. 2).

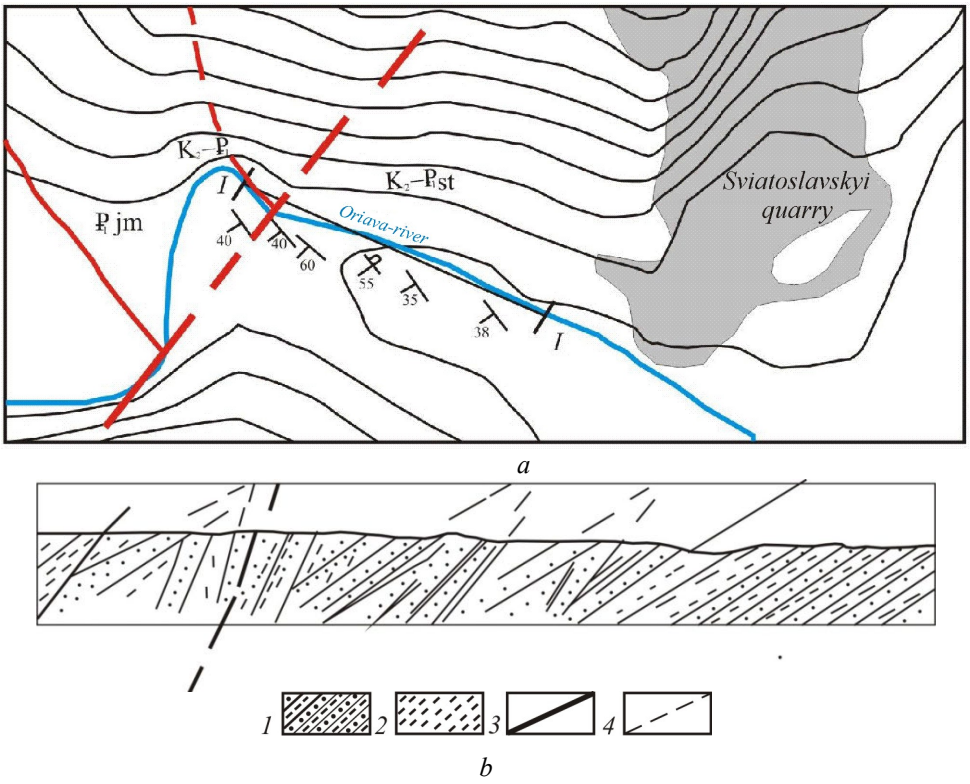

Fig. 2. Map of the research area, scale 1:10 000 (*a*) and geological section along line I–I, scale 1: 5 000 (*b*):
1 – the strata of medium-rhythmic flysch of the Stryiska suite; *2* – the strata of thin-rhythmic flysch of the Yaremchanslyi colourful horizon; *3* – tectonized boundary; *4* – wrench-fault

The obtained data allow us to assume that in this interval of the section the layers of the Stryiska suite sandstones are intensively dislocated. Layers of sandstones and lenses of gritstones have undergone tectonic boudinage with the development of isoclinic folding with the curves of fold destruction – in the form of chevron folds, which to some extent have been disintegrated. Layers of aleurolites and argillites have been exposed to actively cleavage. The crushing process has been completely stimulated by the direction of tangential stresses. The maximum concentration of tangential stresses is available in the fold bends [3]. The degree of compression of the folds and the angle of gradient of the layers increase with the approach to the steeply-dipping fault, which is, according to morphology, a strike-slip fault with the strike of fault surface NE 40°.

The study of superposed deformations leads to the conclusion that the morphology of folds that arose consistently is not accidental. Folds developed so that the role of plastic deformations in their formation gradually decreased, and the role of fragile deformations increased. Folds have been divided into separate tectonic scales by viscous ruptures, parallel to the plane of the main cleavage. A characteristic monovergent structure reflects the system of

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upthrow fault–fault with the development of the imbrication, which has been caused by the layered gliding on the boundary (contact) of various lithological formations: the sandy-clayey rocks of the Stryiska suite and the silty-clayey rocks of the Yaremchanskyi horizon. Vergence of such a structure is subordinated to the movements of flysch packets under conditions of directed regional compression [1, 4].

Conclusions. Direct observations and analysis of the results of large-scale mapping and associated lithologic-stratigraphic studies make it possible to argue that the boundary between the uneven-aged stratums (the Stryiska suite and the Yaremchanskyi horizon) is tectonized due to not only layered gliding of these strata (different in lithology and rheology), but also the kinematic effect of fixed by us low-amplitude left-sided wrench-fault. Because of this structural paragenesis of disjunctive dislocations in the contact area, we trace "transitional" layers. In them, among the thin-rhythmic incompetent rocks of the colourful Yaremchanskyi horizon there are layers of competent sandstones of the Stryiska suite. The width of this contact area is 50 m.

Consequently, we associate the change in the lithological composition, and hence – the facial variability and the unsteadiness of the thickness of individual flysch strata with the conditions of sedimentation and longitudinal and transverse tectonic zoning of the trough basin.

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ЛІТОЛОГО-СТРУКТУРНІ ОСОБЛИВОСТІ РОЗРІЗУ МЕЖІ ВЕРХНЯ КРЕЙДА–ПАЛЕОГЕН ТИЛОВОЇ ЧАСТИНИ НАСУВУ СКИБИ ПАРАСКА В РАЙОНІ С. КОРОСТІВ

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Наведено нові дані про літологічний склад верств зони контакту між відкладами верхньої крейди та палеогену флішової товщі, яка відслонена в тиловій частині скиби Параска в лівому борті р. Орява (північно-східна околиця с. Коростів Сколівського р-ну Львівської обл.). За результатами крупномасштабного картування проаналізовано співвідношення окремих верств розрізу та визначено структурні особливості цієї зони контакту. Загалом розріз відображає структуру імбрикації, зумовлену пошаровим проковзуванням верств; він ускладнений малоамплітудним круто нахиленим лівостороннім скидо-зсувом. Зміну літологічного складу та фаціальну мінливість відкладів ми пов'язуємо з умовами седиментації та повздовжньою й поперечною тектонічною зональністю трогового басейну.

Ключові слова: скиба Параска, скидо-зсув, структура імбрикації, флішові відклади, Українські Карпати.