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The Early Kimmeridgian succession at Kodrąb (Radomsko elevation, central Poland) and its palaeogeographical and palaeotectonic implications – discussion

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The paper published by Wierzbowski and Głowniak in Geological Quarterly, vol. 3, 2018, abbreviated below as Wierzbowski and Głowniak (2018), deals with the Early Kimmeridgian succession studied mainly at the Rogaszyn Quarry in Kodrąb. The authors presented also correlations with neighbouring areas. Furthermore, they provided the conclusions concerning the synsedimentary tectonics related to the Holy Cross Mts. lineament. The authors of the following discussion carried on their own field observations using the investigation pits to expose some parts of the succession and sampled the sediments in the Rogaszyn Quarry described by Wierzbowski and Głowniak (2018). Based on these results, we found that our succession of sediments from the Rogaszyn Quarry differs from that published by Wierzbowski and Głowniak (2018). The paper by Wierzbowski and Głowniak (2018) contains an incorrectly prepared Kimmeridgian profile and incomplete and imprecise documentation of sediments from the Rogaszyn Quarry. In our opinion, such dataset cannot be the source of regional correlations with adjacent regions and cannot provide conclusions concerning the synsedimentary tectonics. Due to limited volume for discussion we would like to indicate in this short paper some of the controversial aspects published by Wierzbowski and Głowniak (2018). Sedimentary succession from the Rogaszyn Quarry with extended discussion containing lithological profiles as well as macroscopic and microscopic characterization of sediments from the quarry will be presented in a separate article.

According to Wierzbowski and Głowniak (2018), the succession from the Rogaszyn Quarry includes 12 rock units (cf. Barwicz-Piskorz, 1992, 1995). On page 512, they state that "*The oldest one is the oncolite limestone unit (unit 1)…*", which, in their opinion, is the continuation of the sedimentary succession presented by Kutek (1968) from the Smotryszów Quarry located about 2 km to the south-west of the Rogaszyn Quarry. Despite finding two ammonites, in our opinion, the basis on which the correlation of sediments from both the quarries was made is unclear. Considering the distance between them, their location at the same elevation a.s.l., and the distinct dips of strata: 22–30° at the Rogaszyn Quarry and ~40° at the Smotryszów Quarry (Karczewski, 1965), it seems rather doubtful that the same thin bed with the omission surface (see Wierzbowski and Głowniak, 2018: fig. 2) was identified in both the quarries.

Our field observations indicate that the sedimentary succession from the Rogaszyn Quarry (both in the northern and southern parts of the quarry) starts with massive thick-bedded oolitic limestones. Also according to Karczewski (1965: 100 and tab. 1), the oolitic limestones from the Rogaszyn Quarry crop out at the lowermost part of the quarry. We do not agree that the oolitic limestones are „*…generally poorly exposed in Rogaszyn Quarry section...*", as suggested by Wierzbowski and Głowniak (2018: 519). Their outcrops are, in fact, one of the best exposed and easily accessible ones in the northern and southern parts of the quarry. In our opinion, the position of the oolitic limestones (unit 11) in the sedimentary succession, as proposed by Wierzbowski and Głowniak (2018), is incorrect.

The paper by Wierzbowski and Głowniak (2018: fig. 2) presents a lithological profile, in which the oncolite limestone (unit 1) is overlain by the units 2–6. Units 1–5 are, in turn, shown in fig. 3A (Wierzbowski and Głowniak, 2018). However, the thicknesses of units 2–4 indicated in both fig. 2 and fig. 3A (Wierzbowski and Głowniak, 2018) rise some doubts. In our opinion, based upon our field observations, the total estimated thickness of units 2–4 displayed in fig. 3A (Wierzbowski and Głowniak, 2018) does not exceed 1 m. The thickness of these units can be approximated from the enlargement of that photograph and comparison with discernible grass tufts growing close to the exposure. On the contrary, the thickness of units

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2–4 shown in fig. 2 (Wierzbowski and Głowniak, 2018) reaches about 6 m. Moreover, Wierzbowski and Głowniak (2018) state that unit 3 is about 2.2 m thick, whereas the photograph demonstrates that it is hardly visible in comparison with unit 2 (about 1.1 m thick) and unit 4 (about 2.6 m thick). Unfortunately, the lines separating the particular unit are absent in the drawing. Finally, in fig. 3A of Wierzbowski and Głowniak (2018), the differences in lithologies of units 2–4 are invisible even after enlargement of the photograph, although they should be evident between the alternating marls and limestones. According to Wierzbowski and Głowniak (2018), the middle part of the succession, among others, is represented by unit 7 (strongly bioturbated nodular biodetrital limestones) and unit 8 (micritic limestones with abundant bioclasts). Unfortunately, we did not find these units above units 5 and 6 during our fieldwork, and Wierzbowski and Głowniak (2018) provide no illustrations documenting their existence in the quarry. According to Wierzbowski and Głowniak (2018), units 7 and 8 occur locally within the generally small Rogaszyn Quarry and their absence is interpreted as a stratigraphic gap (Wierzbowski and Głowniak, 2018: fig. 2, tab. 1). Furthermore, such a local appearance of units 7 and 8 may indicate synsedimentary tectonic movements (Wierzbowski and Głowniak, 2018: 519). In our opinion, such important conclusions based upon an insufficiently documented succession are much too far-reaching.

It must be emphasized that during our fieldwork we did not find four marly horizons (belonging to unit 12) in the quarry, from which three horizons attain a thickness of about 2 m, as is presented by Wierzbowski and Głowniak (2018) in figure 2. In addition, it is not clear and consequent why unit 12 (Wierzbowski and Głowniak, 2018: fig. 2), which is formed by several lithologic types (~13 m thick), is not divided into separate units. The other units 2–6 (9 m thick) are presented as several separate units. Finally, it is unclear on what basis Wierzbowski and Głowniak (2018) positioned unit 12 over the oolitic limestones of unit 11.

The legibility of presented lithological profile of the Rogaszyn Quarry raises some doubts. Despite the erroneous sedimentary succession, the drawing quality of the profile is poor. Moreover, the profile legend does not explain all hatchings seen in the drawing and some hatchings used in the profile differ from those in the legend. The photographic documentation of sediments from the Rogaszyn Quarry reveals many deficiencies. Photographs were taken at excessive distances to the outcrops, precluding facies identification. Suitable would be the close-up photographs, which would enable the Reader to discern characteristic features of described sediments. Some photographs document mostly the rubble. There are no photographs of important outcrops of, e.g., oolitic limestones which, in our opinion, are crucial for discussed scientific problems. Moreover, some sedimentary units (7, 8, 11 and 12) marked in the profile lack any photographic documentation. Some of the units in figure 3B in Wierzbowski and Głowniak (2018) are improperly marked. It is clear that the position of the white inclined line separating units 5 and 6 is wrong because below this line the inclined layer of grey marls of unit 6 is clearly visible, partly covered with the rubble.

In the chapter on the comparison with the adjacent areas, Wierzbowski and Głowniak (2018: 517) state that „*The deposits outcropped at Kodrąb can be easily compared with coeval deposits known from the adjoining areas*...". However, taking into account the incorrect lithological profile of sediments from the Rogaszyn Quarry provided by Wierzbowski and Głowniak (2018), such comparison can be difficult. Additional difficulty may be due to differences in correlation of marl units from various regions and various papers. For example, Matyja and Wierzbowski (2014: 13) compared the D_3 marly member (Platynota Zone, p. 16), 22–37 m thick, from the Tomaszów Syncline with the so-called Lowermost Marly Horizon, several metres thick, from the southwestern rim of the Holy Cross Mts. (Kutek, 1968, 1994; Matyja, 2011; Krajewski et al., 2014, 2017) and with the so-called middle marly unit from the Wieluń Upland („zms" in Wierzbowski, 1966; Wierzbowski et al. 1983). On the contrary, Wierzbowski and Głowniak (2018, e.g., tab. 1) correlate the D_3 marly member from the Tomaszów Syncline with the Kiełczygłów Marl Member (both belonging to the Hypselocyclum Zone) which, according to Wierzbowski (2017: 74), corresponds to the upper marly member from the Wieluń Upland („zmg"; Wierzbowski et al., 1983). The comparison of lithostratigraphic units, biostratigraphic data and, particularly, correlations of isochronic marl units referred to differences in thickness of coeval deposits in various regions of Poland encouraged Wierzbowski and Głowniak (2018) to identify the synsedimentary tectonic activity. However, it cannot be precluded that the quoted thickness discrepancies result from erroneous comparison of different, regionally extended marl units showing significantly different thicknesses. It is interesting to note that, when constructing the regional correlation with the Bełchatów area, Wierzbowski and Głowniak (2018: tab. 1) refer to unpublished data from the Bełchatów Geo-2a borehole completed in the 1960s, but ignore papers of other authors from that region, in which sedimentological profiles (e.g., Mrozek, 1975; Barwicz-Piskorz, 1992; Barwicz-Piskorz and Szewczyk, 1994; Krajewski et al., 2014) of the similar Kimmeridgian facies were presented. Moreover, the sedimentary succession from Kodrąb (~340 m thick), based on fully cored boreholes drilled for geological documentation of deposits, were presented and correlated with adjoining areas by Barwicz-Piskorz (1992, 1995). It is suprising that those publications concerning Kodrąb were ignored by Wierzbowski and Głowniak (2018).

The important problem discussed by Wierzbowski and Głowniak (2018) is the synsedimentary tectonic related to activity of the Holy Cross Lineament (see also Wierzbowski, 2017). We readily accept the opinion that, at some stages of platform evolution in central and southern Poland, deposition was controlled by synsedimentary movements along broad and deep tectonic zones (e.g., Krajewski et al., 2014, 2016, 2017) as e.g., the Holy Cross Fault. However, such conclusion does not result from premises presented by Wierzbowski and Głowniak (2018) but from data documenting an intensive development of gravity flow deposits (e.g., debrites, calciturbidites) along the edges of tectonic grabens active in the Mesozoic and developed along broad tectonic zones.

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