Acta Geologica Polonica, Vol. 69 (2019), No. 1, pp. 107–109
DOI: 10.24425/agp.2019.126435

DISCUSSION

ON Radwańska, U. **Selected Oxfordian brachiopods from Zalas (Cracow Upland, Poland)**, *Acta Geologica Polonica*, vol. 67, no. 3, 2017

URSZULA RADWAŃSKA (2017) presents the Upper Jurassic craniid and thecidellinide brachiopods from the Zalas Quarry (Kraków Upland, Poland) and discusses the ecological conditions of their growth, including substrate, bathymetry, and even Late Jurassic seawater temperature. Although the main subject of the paper is brachiopod fauna – their description and systematics – it also includes palaeoecological considerations based upon the development of Upper Jurassic sediments observed at the Zalas Quarry. It is obvious that the recognition of relationships between the composition of craniid and thecidellinide brachiopod assemblages and the host rocks must be based upon a credible description of Upper Jurassic sediments, and therefore must refer to the current state of knowledge. Unfortunately, Radwańska (2017) does not meet this standard.

In the Zalas Quarry, the intensive extraction of ryodacite results in the continuous exposure of fresh fragments of Middle and Upper Jurassic overburden. In recent years, the development of sediments in these new outcrops was presented at two prominent international conferences: the 7th International Congress on the Jurassic System in 2006 and the 31st Meeting of the International Association of Sedimentologists in 2015, and in their associated published proceedings (see Matyja 2006 and Matyszkiewicz *et al*. 2015, respectively), as well as during the domestic conference Jurassica VI in 2007, which also resulted in published proceedings (Matyszkiewicz *et al*. 2007). Additionally, a detailed description of carbonate buildups from the Zalas Quarry is available in a separate paper by Matyszkiewicz *et al*. (2012). Unfortunately, none of these publications was considered by Radwańska (2017) with regards to either the description of geological setting or for palaeoenvironmental interpretations.

Undoubtedly, the selection of literature (including that concerning the geological setting), is the privilege of the author. However, it is unacceptable that Radwańska (2017) refers almost exclusively to publications, which are of either (i) historical value, (ii) belong to the realm of popular science literature, or (iii) are over 30 years old, (i.e., reflecting both the utterly different appearance of Upper Jurassic exposures and comparably limited knowledge of Upper Jurassic carbonate buildups from the Zalas Quarry).

The preliminary characterisation of Jurassic sediments from the Zalas Quarry provided by Radwańska (2017, p. 433) is reduced to only a single sentence: "… The Jurassic sequence of Zalas has been a subject of numerous reports (e.g., Roemer 1870; Zaręczny 1894; Wójcik 1910; Gradziński 1960; Tarkowski 1989; Gradziński and Gradziński 1994)". This 'summary' of Jurassic strata is found again on the same page with minor modification: the word "reports" was replaced by "descriptions". Even the reader less familiar with the problems of Jurassic deposition in Poland will easily recognise that the value of first three cited publications is only historical. Those more familiar with the Jurassic sediments know that the paper by Tarkowski (1989) deals with ammonite fauna in bedded Callovian and Oxfordian carbonates, and that the papers by Gradziński (1960; it must be noticed that an updated version was reissued in 1972) and by Gradziński and Gradziński (1994) belong to the realm of popular science literature: the latter, in particular, contains only a few sentences referring to Upper Jurassic sediments from the Zalas Quarry.

It seems that Radwańska (2017) sourced the description of geological setting mainly from Matyja and Tarkowski (1981) and Trammer (1982, 1985). Unfortunately, these valuable papers were based upon the Upper Jurassic exposures from the early 1980s. Radwańska (2017, p. 433) describes the Oxfordian succession as follows: "…variegated marls and marly limestones (about 2 m thick) of the Cordatum Zone, covered by a carbonate buildup (cyanobacte-

ria-sponge bioherm), and by thin-bedded limestones and marls, or platy limestones (about 10 m thick) of the Middle Oxfordian Tenuicostatum Subzone of the Plicatilis Zone (see Matyja and Tarkowski 1981, figs 2–3)". This paragraph is almost identical with the description of Oxfordian succession in Radwańska (2005, pp. 63-64), which is understandable. However, in the paper from 2005 we find the remark that the "… cyanobacteria-sponge bioherm [is] now completely removed by the quarry works…", whereas in the paper published 12 years later, the remark that this bioherm was already destroyed by mining operations no longer exists. The reader familiar with the literature must feel somewhat lost, as it is hard to understand the current status of such an important outcrop.

In the early 1980s, the only bioherm exposed in the Zalas Quarry was described by Trammer (1982, 1985). In a further paper, Trammer (1989) proposed the term "loose" bioherm for specific, sponge-rich bioherms from the lower part of the Oxfordian succession in the Kraków-Częstochowa Upland. According to Trammer (1982, 1985), algae and stromatolites were absent from such bioherms.

Despite the fact that the description of the geological setting provided by Radwańska (2017) refers to that from the 1980s (which was not clearly indicated in the text!), the reader encounters mutually contradictory terms in the text: they read about "…cyanobacteria-sponge bioherm…" (Radwańska 2017, pp. 433, 438), which suggests that microbialites are the main components of that buildup, but they also read (after Trammer 1982, 1985) that "…[characteristic] is the lack of stromatolites and algae…" (Radwańska 2017, p. 438).

The carbonate buildups from the Zalas Quarry were described in detail by Matyszkiewicz *et al*. (2012) and categorised in a modern terminological framework after Riding (2002). Three types of carbonate buildups were observed: (1) low-relief carbonate mud mounds (so-called "loose bioherms"), (2) segment reefs (so-called "pseudonodular bioherms"), and (3) filled frame reefs with stromatactis (Matyszkiewicz *et al*. 2012). Numerous microbial structures are developed in all of these forms. Even in the low-relief carbonate mud mounds (or "loose bioherms") first described by Trammer (1982, 1985, 1989), microbialites are present as pure, clotted, and layered leiolites, clotted thrombolites, and micropeloidal and agglutinating stromatolites (Matyszkiewicz *et al*. 2012). Moreover, in all these buildups, microbialites built a rigid framework that is visible at various stages of development. It is even valid for the low-relief carbonate buildups, where microbialites can be encountered in growth cavities and in penetrations filled with internal sediments with bioclasts (Matyszkiewicz *et al*. 2012, fig. 6a), suggesting a local occurrence of an initial form of rigid framework. Therefore, the simultaneous statement of Radwańska (2017, p. 438) that a distinctive feature of the carbonate buildup from the Zalas Quarry is the absence of stromatolites and the usage of the term "cyanobacteria-sponge buildup" is not only an internal contradiction, but also does not reflect the recent state of knowledge.

With regards to the location of the brachiopod samples, Radwańska (2017, p. 434) writes that: "… [the] more precise horizon of particular specimens cannot be determined, as all specimens were collected from scree and/or rainfall outwash…". Surprisingly, a few pages further Radwańska (2017, p. 438) quite precisely defines the sampling site: "… The material presented herein comes from the fossil-rich slope deposits of the cyanobacterial-sponge bioherm…". Unfortunately, this statement together with the opinion (Radwańska 2017, p. 439) that "… the Zalas bioherm is composed almost exclusively of lithistid sponges, which indicate rather deep waters, exceeding one hundred metres in depth (Trammer 1982; Pisera 1997)…" are based upon erroneous premises.

The lack of reference to the results of modern studies on carbonate buildups from the Zalas Quarry influences further discussion on the potential environment in which craniid and thecidellinide brachiopods might have grown. Radwańska (2017, p. 438) proposes only a single concept: "…it is possible that most specimens were attached to the surface of the sponges…". However, considering the above-mentioned aspects of carbonate buildups, it may be possible that a numerous fraction could also have settled in both the growth cavities and penetrations in microbialites. As the forms typical of cryptic habitats, the Late Jurassic thecidellinide brachiopods might have even lived in deeper recesses of the caves constrained by thrombolites and other microbialites (Taylor and Palmer 1994; Schmid 1996).

Received: 21st October 2018

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