Referee's report on the doctoral thesis:
Lucie Vaňková: Lower Cretaceous belemnites (including J/K boundary interval) in the NW Tethys, biostratigraphy, palaeobiogeography and palaeoecology

Mesozoic belemnites are abundant but still relatively poorly known, and because the Cretaceous period still lacks the GSSP, the J/K boundary interval is in the focus of the international research activity. For these reasons, the subject of the thesis is interesting and topical. At the same time, the candidate was faced with a hard job since accumulations of rostra in complicated geological structures with intensive and repeated tectonic history made the investigations difficult – as it is explained on page 11.

Overall remarks on the thesis

By way of introduction, I can say that the candidate made a good job, but some critical issue also have arisen.

The first chapter, "Introduction", is adequate and also readable. The different focuses of the multiproxy study, the aim of the research and the role of the candidate within the team, were made clear. Related to the second and third chapters, "Geological setting" and "Material", I miss the illustration of the Kotouč Quarry pockets, from where the majority of the studied belemnites were collected. The fourth chapter, "Methods", is the most extensive part of the thesis, it contains 13 pages, which seems to be strange, in same way. It is partly because some of the paragraphs (listed below) here do not fit properly with the subject of the given titles.

The first part of chapter 4.1. is partly the repetition of some sentences of the "Introduction", and most all, these thoughts are inadequate in this context – these are nothing to do with subject of the chapter (i.e. methods). Further on, the otherwise interesting description of previous works on belemnites, the text is still not the description of methods. The same is true for the majority of chapter 4.3. and 4.4., which are about morphological parameters of rostrum and classification and on palaeoenvironmental reconstruction, respectively. In case of 4.3. I miss a figure which illustrates the majority of the listed terms, like Fig.3, which shows some duvaliid features only. Chapter 4.4.2 is again a rather a detailed summary of relevant previous works on the topic, then the solid description of the applied geochemical process, which is given only in the very last paragraph of the subchapter and also in the following pages, in chapters 4.4.2.1–4.4.2.3.

According to me, systematics (4.3.3.) is so important that even if it kept to the minimum length, it requires a separate chapter, and does not form a subchapter of "Methods". Since the candidate was working on a large fossil material, and recognised numerous taxa in the diverse fauna, I would have expected 1-2 illustrative photo plates on the belemnite guards even if some specimens are figured in the attached and already published articles.

The fifth chapter, "Result and discussion" contains about 10 pages only and focusing on the main results of the research. The last chapter "Conclusion" hardly exceeds a single page. In spite of this tight and short summary, since the thesis can be considered as a cumulative paper thesis, where three published scientific articles and a further submitted manuscript are attached alongside with the thesis, the scientific achievements of the candidates are convincing. I found the result correct and interesting.

The DTP work is well done. Being a non-native English reviewer, unfortunately, I cannot judge the correct usage of the language – but it seems to be fine.

Critical comments on minor issues

The title of the thesis is not really proper, simply because J/K boundary interval is *not* included into the Lower Cretaceous. A related problem is the incorrect use of chronostratigraphic and geochronologic unit terms, which appears already in the abstract (i.e. "…ranges from the Lower Tithonian to the late early/early late Barremian…"). We all know what is the difference between rocks and the represented time, but we have also to follow the rules.

Fig. 2 is rather complex, but its caption is insufficient. One cannot really understand the meaning of all the details. Even if the figure is from an already published paper, which was attached to the thesis, and where the full caption can be seen, it is incomplete in this way.

On Fig. 4, bathymetric preferences of different genera are illustrated but it is unclear if all the form reached the oceanic zone? If so, why all the arrows on the figure are positioned in different environment?

The title of chapter 5.3 needs rearrangement. Suggestion: "Belemnites from the Kotouč Quarry as potential indicators of the palaeoenvironment".

Questions to the candidate

Belemnites workers often operate with "belemnite assemblages", – a practice which was followed also by the candidate –, and they intentionally avoid the term "belemnite zone". Why?

My second question, which is indeed, a bunch of questions, is a bit out of topic, but I really wonder what the answer will be. The candidate handled an impressive number of belemnite guards (10 000 specimens!), and I wonder how many of them possess acrothoracica pits? Were the pits oriented and/or host-specific? I recognised some pits of this kind only on Fig. 6/7 of the applicants paper submitted to Cretaceous Research. Adolf Seilacher published exciting, but also debated ideas about the origin of these pitted belemnites. Were the guards pitted alive? I wonder, what is the critical opinion of the candidate about the origin on these traces?

Final comments

In my opinion the submitted thesis is good, represents high standard, and the already published papers with the contribution of the candidate are excellent. As a summary, I conclude that the submitted MS fulfils the requirements of a PhD thesis, and I warmly recommend issuing the PhD degree to the candidate.

I congratulate to Lucie Vaňková, and I wish her a successful and long lasting palaeontological carrier.

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