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Reader‘s Dissertation Thesis Report

Masaryk University **Faculty of Science**	
Doctoral Study Field	Geology
Student	***Mgr. Pavel Barták***
Disertation Thesis Title	*New findings on the lower vertebrates from the Nýřany locality (Czech Republic) using micro-computed tomography*
Reader	PD Dr. Florian Witzmann
Reader’s Workplace	Leibniz-Institut für Evolutions- und Biodiversitätsforschung, Berlin

Text of the report (its extent is on reader‘s consideration) …
The dissertation by Pavel Barták addresses the description, phylogeny, and ecological interpretation of actinopterygian fishes and basal tetrapods from the famous late Carboniferous Nýřany locality in the Pilsen Basin, Czech Republic. His work relies to a large extent on the application of non-invasive imaging techniques, such as micro-computed tomography (µCT), to redescribe previously known material and to document hitherto unknown or unpublished specimens. This approach is particularly important because earlier studies of the fishes and tetrapods from Nýřany were largely restricted to traditional morphological investigations, whereas Pavel Barták has convincingly demonstrated that µCT can reveal a wide range of previously unrecognized features in these fossils. These newly identified characters, in turn, allow for more refined phylogenetic analyses as well as a more robust assessment of the life habits and ecological roles of the respective taxa. The dissertation is a comprehensive summary based on three published papers in all of which Pavel Barták’s personal contribution is substantial and clearly evident, and in which he is consistently the first author. The dissertation is clearly structured with an English and a Czech abstract and five chapers: (1) Introduction, (2) Materials and Methods, (3) Summary of the dissertation thesis results, (4) Conclusions and (5) References. The three published papers are included as Appendices 1–3. The figures in the dissertation are consistently of excellent quality.

The introduction chapter provides a very good entry into the subject. All essential information on the geology, age, palaeoenvironment, and faunal composition of the Nýřany locality is presented in a concise yet very illustrative manner. The same applies to the overview of the more than 150-year history of research at Nýřany. The outstanding scientific significance of the locality is clearly shown, and the aims and objectives of the dissertation are formulated.

In the second chapter (Materials and Methods), an overview of the studied specimens as well as the methods of investigation and analysis is provided. A large and taxonomically diverse sample of fishes and basal tetrapods from Nýřany is examined; these specimens are housed in numerous Czech, Austrian, and German institutions and were studied first-hand by Pavel Barták. A wide range of both established and innovative methods and approaches is employed, including classical comparative morphology, µCT scanning with subsequent generation of three-dimensional models, scanning electron microscopy (SEM), computer-based phylogenetic analyses, and investigations of cranial ontogeny in basal tetrapods such as baphetids and nectrideans.

Chapter three, entitled *"Summary of the Dissertation Thesis Results"*, consists of three subchapters, each of which summarizes one of the published papers included in the Appendix. Here again, Pavel Barták succeeds in clearly identifying and effectively presenting the key results and scientific significance of his work despite the necessarily concise format.

The first subchapter summarizes the paper "New, large actinopterygian fishes from the Upper Carboniferous of Nýřany, Czech Republic", published in *Acta Palaeontologica Polonica* in 2024. This study documents for the first time the presence of large-bodied actinopterygians at Nýřany and discusses the palaeoenvironmental implications of these findings. A new species, *Stambergichthys macrodens*, is erected. The paper provides a carefully executed description of fragmentary bones and teeth, supported by modern imaging techniques that reveal internal bone structures and tooth microstructure. Numerous high-quality illustrations present informative three-dimensional models. The assignment of the material to actinopterygians is convincingly justified. Particularly noteworthy are the extensive morphological comparisons with fossil and extant taxa, as well as the discussion of life history and feeding ecology. The documentation of plicidentine in *Stambergichthys* and its functional interpretation strongly suggest a role as a top predator. Pavel Barták concludes that these large actinopterygians most likely originated from a nearby fluvial system rather than indicating a deep-water environment, a view supported by independent sedimentological evidence.

The second subchapter reviews the article "The revision of baphetids from the Middle Pennsylvanian of the Czech Republic: Morphology, ontogeny, palaeoecology, and the reassessment of the phylogeny of Baphetoidea", published in *Anatomical Record* in 2025. This study presents the first comprehensive revision of baphetoid material from Nýřany and the most extensive phylogenetic analysis of the group to date. It represents a major contribution to the understanding of baphetoids and is likely to become a key reference. The descriptions are meticulous, the illustrations clear, and previous interpretations are critically evaluated. The new phylogenetic analysis challenges earlier hypotheses and is discussed in detail. Of particular interest is the documentation of ontogenetic changes in *Baphetes*, indicating largely gradual development, what stands in stark contrast to other early tetrapods like temnospondyls. The palaeoecological analysis suggests that baphetoids inhabited the same fluvial system as the large actinopterygians.

The third subchapter summarizes the article "The exceptionally well-preserved *Sauropleura scalaris* (Nectridea: Urocordylidae) from the late Carboniferous of the Czech Republic: new information on ontogeny, lateral line and tail", published in 2023 in *Zoological Journal of the Linnean Society*. Based on an exceptionally well-preserved specimen from Nýřany, the study provides a detailed redescription of *Sauropleura*, a poorly understood urocordylid lepospondyl. Using µCT techniques,

Pavel Barták identified numerous previously unknown features, including a lateral line system, neurocranial ossifications, and new data on tail morphology. The comprehensive anatomical description integrates classical methods with high-quality three-dimensional models and comparisons with other early tetrapods. The redescription of the skull enabled a revised cranial reconstruction that differs markedly from earlier interpretations. The first documentation of lateral lines in *Sauropleura* is of particular significance for understanding its mode of life. In addition, the paper provides a valuable overview of the distribution of lateral line systems in early tetrapods, including a discussion of their phylogenetic implications. The discussion further includes an especially useful section on the identification of terrestrial adaptations in early tetrapods, which is of broad relevance and general interest. Particularly important are the new insights into cranial ontogeny, which are rare among urocordylids and other lepospondyls.

The Conclusions chapter reiterates the significance of the Nýřany locality and its vertebrate fauna, summarizes the dissertation's content, and outlines perspectives for future research.

Each of the individual studies summarized above (published articles 1–3) addresses scientifically relevant research questions that were investigated and presented at a very high methodological and conceptual level, as reflected by their publication in renowned peer-reviewed scientific journals. The depth and rigor of these studies demonstrate Pavel Barták's ability to master diverse thematic fields and analytical approaches. The results concerning the evolution, anatomy, and palaeoecology of the Nýřany vertebrate assemblage are highly novel and significantly advance our understanding of Late Carboniferous vertebrate communities and their environments.

Sincerely,

Conclusion

In the dissertation thesis, the student has demonstrated his/her creative abilities in the relevant research area:

YES ☒ NO ☐

I am recommending the dissertation thesis for defence:

YES ☒ NO ☐

Date 08. January 2026

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Signature

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