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Review of the doctoral dissertation by Magister DRASHTI R. PARMAR, entitled "Reconstructing Evolutionary Histories of Callimorphidae (Diptera: Cyclorrapha: Oestroidea) at Different Taxonomic Levels Using Phylogenomic Methods"

The doctoral thesis submitted for review, authored by **Drashti R. Parmar, M.Sc.**, was carried out at the Nicolaus Copernicus University in Toruń under the supervision of **Krzysztof Szpila, Prof.**, and **Nikolas P. Johnston, Ph.D.**
The dissertation addresses a broad spectrum of evolutionary aspects within the blowflies, a large, highly diverse, and economically important family of flies.

Evaluation of the Editorial Aspects of the Dissertation

The dissertation under assessment consists of 220 pages and is written in English. Its layout is clear and consistent with the conventions typically applied to works of this type. The study begins with an Author's Declaration outlining the formal and general principles followed during the preparation of the dissertation. This is followed by the Acknowledgements and the Abstract (provided in both English and Polish). Next appears a list of the four manuscripts included in the dissertation, followed by the table of contents.
The main part of the dissertation is 65 pages long and is divided into an introduction, materials and methods—with all analyses described in great detail—results, discussion, and conclusions. This section ends with a bibliography containing an impressive list of 144 items, as well as Table T1, whose caption refers to a somewhat

difficult to follow Table S1. There are in fact three separate tables with partly overlapping lists of taxa.

This central part of the dissertation is followed by four substantial papers, comprising 10, 54, 25, and 61 pages respectively. The first three are already published articles, while the fourth is a manuscript submitted to *Molecular Biology and Evolution*. Each paper follows the standard structure of a scientific publication, including an introduction, materials and methods, results, discussion, and a complete set of dedicated appendices.

The visual and aesthetic value of the dissertation is further enhanced by elegant illustrations placed at the beginning and end of the work, accompanied by personal statements from the Doctoral Student. To me, these statements bear witness to her deep and genuine interest in the research she conducted. Overall, the dissertation is well-organized and easy to follow. I assess its editorial quality very highly.

Evaluation of the Merits of the Thesis

a) Scientific Value of the Dissertation

I assess the scientific value of the dissertation very highly. I welcomed the opportunity to evaluate the thesis of Ms. Drashti R. Parmar with great scholarly satisfaction, owing to my own closely related scientific interests as well as the evident global scarcity—and simultaneous need—for studies of this kind concerning the evolution of specific groups of organisms. This is particularly true when it comes to a taxon as behaviourally, geographically, and ecologically diverse as the Calliphoridae. Moreover, these flies are insects of unquestionable importance to humans. I therefore consider both the choice of the study group and the scope of the research to be fully justified.

I would also like to emphasize that Calliphoridae represent a relatively young evolutionary lineage certainly undergoing currently an intensive phase of diversification, which makes it even more challenging to identify and interpret the processes and patterns observed. I believe that the structure of the dissertation submitted for evaluation is also highly appropriate. Within the framework of the overarching research theme, the Doctoral Candidate successfully formulates

hypotheses of both a broad, more universal nature (Aims 1 and 2) and a more specific character (Aim 3), focusing on evolutionary relationships within Calliphoridae. Furthermore, she complements these aspects skilfully with ecological considerations (Aim 4) and, finally, appropriately highlights their significance for forensic entomology (Aim 5).

b) Originality of the Research

The dissertation submitted for evaluation is an original study, and the leading role of the Doctoral Student in planning and conducting the analyses as well as preparing the manuscripts is beyond any doubt. In each of the four publications included in the dissertation, the PhD student is listed as the first author, and in three of them she also serves as the corresponding author.

The three already published papers clearly specify the Student's contribution to their creation, consistently indicating her responsibility for conceptualization, conducting formal analyses, writing, reviewing, and editing the manuscripts. The overall substantive scope of work performed by the Student in these publications is decidedly greater than that of any of the remaining co-authors. This confirms her leading role in the preparation of the publications forming the basis of the dissertation.

Only the last manuscript—submitted to a journal but not yet published—does not include such detailed author contribution statements, which I found somewhat surprising. Nonetheless, considering the explicit information provided in the previous three papers and the high quality of the dissertation itself, I have no doubt that in this case as well the Doctoral Student (with the expected support of her supervisor, who is the corresponding author) was the *spirytus movens* behind both the research and the manuscript.

Scientific competences of the doctoral student

The completion of the dissertation required the Author to demonstrate broad competences across multiple research domains—from planning and designing the study, through selecting and obtaining research material, assembling databases, and

choosing appropriate analytical methods and tools. The presentation of the results, structured around four research questions formulated at the outset, coherently integrates all components of the dissertation.

In the reviewer's opinion, the following research competences are particularly noteworthy and deserving of recognition:

- Competent application of modern phylogenetic methods used for the analysis of obtained genetic sequences (such as genome skimming, mitochondrial phylogenomics, and comparative mitogenomic analyses);
- The ability to prepare a clear and "convincing" species description that includes all essential information and complies with the rules of the *International Code of Zoological Nomenclature*;
- Skilful presentation of results, with clear sensitivity to the informational value and clarity of figures and tables;
- Very good knowledge of scientific literature, enabling the identification of a relevant research problem and the critical evaluation of the achieved research results.

Strengths and weaknesses of the dissertation

I consider the strongest points of the dissertation to be:

- an exceptionally wide range of phylogenetic methods and analyses**;**
- the inclusion of a large number of taxa (115 species**)**, representing all subfamilies and covering a broad geographic range;
- the thoughtful integration of ecological (parasitic traits), biogeographic, and evolutionary (divergence-time) aspects into robust phylogenetic considerations.

Last but not least, as an experienced editor, I would like to emphasize the remarkable care with which the dissertation has been prepared. The accuracy of the literature lists, both in the dissertation and in the fourth manuscript, attests to this level of diligence. The only error I identified is the incorrect publication year of the Hall and Wall paper listed on p. 3 as 2005, while the correct year is 1995.

The few editorial issues present in the fourth manuscript are as follows:
- incorrect colours in Figures 1 and 2**,** used to mark representatives of the subfamilies *Calliphorinae* and *Luciliinae*; these colours are reversed relative to those indicated in the legend;
- an inappropriate order of taxonomic units in the title of the manuscript**,** which should list taxa from the higher hierarchical taxonomic ranks (in this case, superfamily) to the lowest (subfamily). This is all the more puzzling given that the units are connected by colons, which intuitively suggest inclusion of the group following the colon within the one preceding it.

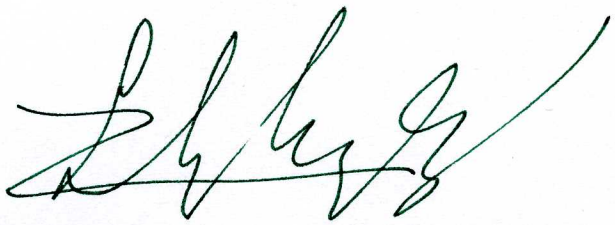
The following points are meant rather as issues for discussion than as criticism of the dissertation:
a) In the fourth manuscript, representatives of **four out of the five genera** belonging to the subfamily were included in the phylogenetic analyses (p. 161). The genus *Dyscritomyia* was not included; moreover, the information provided about it is limited to the brief remark: "Members of the Hawaiian Island endemic genus *Dyscritomyia* are associated with carrion breeding and parasitism of snails…". I understand that research material is not always accessible; however, I would nonetheless expect a more detailed explanation in the manuscript regarding the reasons for not including *Dyscritomyia* in the analyses.
b) I find no information on the presumed origin of the family. Although the Doctoral Candidate mentions that "The basal position of *Toxotarsinae* may suggest a Southern Hemisphere origin for *Calliphorinae*" (p. 31) and that "Divergence dating and ancestral state reconstructions place the origin of *Luciliinae* during the mid-Miocene, with tropical Africa" (p. 38), there is no mention of the origin of the family as a whole.
c) Again in manuscript four. Why did you refrain from making any taxonomic decisions regarding the genus *Lucilla* and the other three genera nested within it?

Final evaluation

Based on the detailed analysis of the dissertation, I conclude that it constitutes an original solution to an important scientific problem. At the same time, it demonstrates the Doctoral Student's broad knowledge and her ability to conduct scientific research independently, including the application of appropriate research methods, the comprehensive analysis of the obtained results, and their discussion in the context of available scientific sources. Her leading role in the development and completion of the dissertation is unquestionable.

In view of the above, I conclude that the evaluated doctoral dissertation of **Drashti R. Parmar** fully meets the conditions specified in Article 187 of the Act of 20 July 2018, *Law on Higher Education and Science* (Journal of Laws of 2024, item 1571, as amended). I therefore request the Scientific Council of Biological Sciences of the Nicolaus Copernicus University in Toruń to admit Ms Drashti R. Parmar to the further stages of the doctoral procedure.

Kraków, 3 December 2025



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