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OPINION

for the PhD dissertation of Bassam Hussein Ibrahim Abubaker, entitled „REVEALING DIATOM DIVERSITY, RARE TAXA AND THEIR ENVIRONMENTAL DRIVERS BY INTEGRATING EDNA METABARCODING WITH MICROSCOPIC APPROACHES”

The dissertation is well-structured, the topics are well-researched, and supported by an extensive and relevant body of literature. The research topic discusses diatom diversity and rarity, the importance of diatom biomonitoring, the limitations of microscopy, eDNA metabarcoding as a potential solution, and the need to integrate both approaches. The dissertation is written in clear, proficient academic English, facilitating communication of its findings to the international scientific community and enhancing the research's overall impact.

The thesis is based on three articles: two first-authored and one co-authored. Publication of the research findings in high-impact international journals confirms the research's quality and significance.

The dissertation begins with a clear general introduction that provides necessary background on diatoms, diatom ecology, and their role in biomonitoring. It further discusses the importance of biodiversity conservation, with particular emphasis on rare species, outlines the limitations of traditional morphology-based identification methods, and eDNA metabarcoding as a new approach for biodiversity assessment and ecological monitoring. It then includes three chapters that cover the dissertation's main objectives.

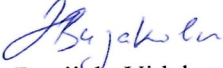
In my previous review, I also noted that each chapter concludes with a summary, but the links between them are missing. The candidate added a General Discussion that provides a broader perspective on the work's scientific contributions, highlights its relevance to future research, and strengthens the dissertation's overall coherence.

I also have some additional questions for the candidate:

1. Given the current limitations of DNA metabarcoding, including incomplete reference libraries, PCR bias, and difficulties in abundance estimation, what level of confidence can we realistically place in metabarcoding-based ecological status assessments compared to traditional microscopy-based approaches?

2. One of the most interesting findings is that many rare species occupy core positions in the ecological network. How do you explain the apparent contradiction between low abundance and high ecological importance?
3. Given the difficulties associated with sampling effort, changing taxonomy, species detectability, and the definition of rarity itself, how confident can we be in our current understanding of rare diatom species, and what should be the priorities for future research in this field?
4. In your dissertation, you state that “rather than asking which method is universally better, we should ask under what conditions each method performs best, what kinds of diversity each captures, and how their outputs can be integrated without losing ecological information.” After completing this research, how do you envision the future role of these methods in biomonitoring? What would an ideal monitoring framework look like, and which tasks would be best addressed by each method?

In conclusion, I consider that the final version of the dissertation has been substantially improved in response to the reviewers' comments and recommendations. The research presented in the dissertation is of high academic value and represents a significant and valuable contribution to the field. Therefore, I recommend acceptance of the PhD dissertation of Bassam Hussein Ibrahim Abubaker.


Dr. Danijela Vidaković

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