Review of the PhD thesis

Biogeography and phenotypic plasticity in silica-scaled chrysophytes (Synurophyceae)

by Mgr. Magda Škaloudová

Short overall assessment

In her PhD thesis, M. Škaloudová focused on biogeographical and morphological aspects of silica-scaled chrysophytes, which were elaborated in five high quality scientific manuscripts that were already published in, or at least submitted to, international, peer-reviewed journals. The presented manuscripts provide both thorough, meticulous research and new approaches. In particular manuscript # 5 is outstanding; it is only the second paper I know of that combines molecular and morphometric analyses in a sound and meaningful way for answering research questions that are of importance to several fields of research.

According to the author's contribution to the manuscripts, M. Škaloudová was able to do her research both independently, as shown in manuscript # 3, and in a team, as illustrated by the other manuscripts. Innovation of research was demonstrated, as previously pointed out. Scientific skills were presented throughout the thesis: the current status of research was well documented, objectives were clearly stated, material and methods, including statistics, were state-of-the-art, appropriate and reproducible, they were carried out carefully, and their limits were discussed. One minor thing I was missing in some of the introductions to the manuscripts was a clear definition of scientific terms that were relevant for the respective manuscript, e.g. 'microorganism' or 'species concept'.

The manuscripts were well structured around the two central themes; working hypotheses were stated accurately and accordingly. The outline of the thesis followed the research concept. Results, discussion and conclusion were presented in a clear and logic way. They answered the research questions. Conclusions were put in a bigger context; however, generalizations were not always supported by facts. Nevertheless, facts and assumptions were clearly distinguishable. The overall conclusions only summarized the general outcome; unanswered questions were disregarded, and suggestions for future work were lacking. In turn, this 'conclusion' extracted the quintessence of the thesis in a concise and comprehensive way without any exaggeration.

The formal quality of the thesis is excellent. Along with their captions, tables and figures were self explanatory and easy to read. TEM and SEM micrographs and light microscopic images were of high quality. English was good throughout the manuscripts; however, the general introduction showed that the candidate might want to improve on her scientific English writing skills.

In sum, I really enjoyed reading the thesis by Magda Škaloudová. I consider the thesis appropriate for defense. Its quality certainly reaches the level sufficient for the PhD degree.

Questions to the candidate

1. Papers # 1 and # 2 of your thesis contrast the neutral model of ubiquitous dispersal of microorganisms, which states 'everything is everywhere', with the moderate endemicity model, which – in short – states that the distribution of microorganisms is restricted. You apply a formal test statistics that defines the neutral model of ubiquitous dispersal of microorganisms as its underlying null hypothesis, and your results suggest that the neutral model of ubiquitous dispersal of microorganisms is not applicable to all microorganisms. A scientist in favor of the neutral model of ubiquitous dispersal of microorganisms might still argue that your results are wrong. Why?
2. In the introduction to your thesis and in paper # 4 you state that silica-scaled chrysophytes were used for biomonitoring purposes and for reconstructing past environmental conditions because – among other reasons – they are widely distributed with a characteristic narrow ecological tolerance. Is this statement self-contradictory? Please elaborate why it is / it is not in the light of the neutral model of ubiquitous dispersal of microorganisms.
3. In paper # 4 you show how temperature affects scale morphology in *Mallomonas kalinae* and *Synura curtispina*, which leads you to the conclusion that the siliceous scales of these organisms have considerable potential in paleoclimate reconstructions. Please list three factors that might limit their potential for reconstructing climate and suggest ways how to overcome these limitations.
4. The correct classification of chrysophytes is a recurrent theme in all of your papers. It builds on species concepts and taxonomy. Please define 'species concept', and how it relates to 'taxonomy'.
5. In paper # 5, you used ITS rDNA phylogeny, (hemi-) compensatory base changes and scale morphology for improving the taxonomy in the *Synura petersenii* complex. Please compare these three methods in the context of objectivity, reliability, validity and reproducibility.

Further technical/methodological comments

The results of biogeographical studies, especially on rare taxa, depend on the sampling effort. I would be interested on the 'stopping rules' or – in other word – on the criteria you applied for concluding that a species was present or absent.

In paper # 4 you state that scale position defined scale morphology. In paper # 5 you used scale morphology for delineating new species. How did you correct for scale position in the latter paper?

Sincerely,

Christian Kamenik