



UNIVERZITA KARLOVA V PRAZE

PŘÍRODOVĚDECKÁ FAKULTA

KATEDRA BOTANIKY

Korespondenční adresa: Benátská 2, CZ-128 01 Praha 2, Czech Republic

Tel.: +420 221 951 646

Fax: +420 221 951 645

A review of J. Juráň doctoral (Ph.D.) thesis: Floristic-taxonomic study of the Euglenophytes

The reviewed thesis concentrates on photosynthetic euglenophytes. The overall aim of the thesis was to contribute to knowledge on diversity, distribution and ecology of euglenophytes with practical overlap to nature protection. The body of the thesis is composed of six scientific papers, five already published in impacted scientific journals, one submitted. J. Juráň contributed significantly to all included papers. The thesis is grouped in three main chapters, accompanied with general introduction and summary of the results.

General introduction provides the connective substance among the papers. Phylogeny of euglenophytes (both photosynthetic and non-photosynthetic lineages) is outlined based on most recent published data. The taxonomy of photosynthetic euglenoids is still not satisfactory solved mostly due to the fact, that many new species and intraspecific taxa that were described represented ecomorphs or different stages of the same life-cycle. J. Juráň highlighted molecular phylogenetic methods as the tool how to solve taxonomic problems. However, this statement is in contradiction to the results of this thesis which is solely based on morphological data. Ecological role of photosynthetic species is stressed and finally distribution of protists in general and Euglenales in particular, is discussed in the introduction.

CHAPTER 1 contains PAPER I which represents commented checklist of species from the territory of the Czech Republic. PAPER II and III report on distribution of two rare species (*Trachelomonas bituricensis* var. *lotharingia* and *T. saccassii*, respectively) in a small mesotrophic pond in the southern part of the Czech Republic. *Trachelomonas bituricensis* var. *lotharingia* would deserve to be introduced in the broader context in than are floristic studies published in the Czech Republic, it means escape from the regional point of view. The part discussing protist distribution in general (the popular: "Everything is everywhere, environments selects" statement, propagated by Finlay and colleagues vs. moderate endemism of Foissner) is repeated all over in all papers within this chapter and, also in the general introduction. I would appreciate discussion about regional checklist importance in the light of both mentioned hypotheses.

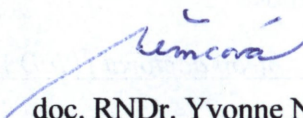
CHAPTER 2 comprises study on morphological variation of *Trachelomonas caudata* complex in natural populations (PAPER IV) and floristic study from a small clay-pit in Poland (PAPER V).

And finally, CHAPTER III is represented by methodological paper concerning microalgae utilization as a part of biotope evaluation process for practical nature protection.

Overall the thesis is well written, general introduction represent state of the art of knowledge on euglenoids. Most of the included paper are more regionally oriented with relatively low number of

citations, so far. However, more time is needed to show the importance of published results. It is evident that J. Juráň is experienced euglenoid specialist with deep knowledge on species diversity and ecology. Therefore, I recommend the acceptance of Josef Juráň's Ph.D. thesis for the defense.

In Prague 24.2. 2019



doc. RNDr. Yvonne Němcová, Ph.D.

Questions for the Candidate:

- 1) How useful method is the DNA barcoding to identify an euglenoid to species? Are the results of barcoding congruent with the ones based on morphology?
- 2) What is your relationship to varieties and forms in taxonomy? What are the main morphological criteria you would use to describe the new species? Could you give an example of the feature that is (according to your opinion) sufficient, and the one which is not to describe a new species.
- 3) Is it possible to define European biodiversity hotspot for euglenoids? Could you speculate on how the hotspot (probably region) could look like?
- 4) Loricas in *Trachelomonas* and *Strombomonas* are important for species delimitation. How long does it take the lorica to fully develop? How polysaccharides are extruded, what determines the shape (or the length of spines and their distribution)? I was interested in finding that the lorica contains substantial amount of Si? Do you know or can you speculate on what form the Si is present? Is there any relationship between water and lorica composition?



PhD Thesis Review

Author: Mgr. Josef Juráň

Title: Floristic-taxonomic study of the Euglenophytes, Implications for their ecology, distribution and practical protection

Josef Juráň pays attention to a very interesting group of algae, which share features originating from algae and protozoans. I appreciate that Josef decided to focus his scientific interest on these extraordinary algae, because phycological community in the Czech Republic needs more specialists. Josef based his PhD thesis on long-term floristic investigation. Nowadays, a high number or majority of PhD theses use molecular methods to support taxonomic investigations. On the other hand, I consider knowledge of traditional approaches and criteria essential for taxonomic studies. Josef collected a lot of field material or literary data and published or submitted six articles as author or co-author. PhD thesis proves that Josef has become a specialist in the taxonomy of Euglenophytes. I consider his thesis clear, compact and very well written. It indicates that Josef is familiarized with taxonomy of studied algae. General introduction summarizes taxonomy, ecology and distribution of Euglenophytes. In the chapter "Euglenoids taxonomy – main problems and tasks in Euglenales" I appreciate historical background concerning a main milestones in 19th and 20th century. In general, I did not find any fundamental mistakes. I found few formal mistakes concerning absence of italics in Latin names (all text). Figure 1 (phylogenetic tree, page 7) should be placed as usually used. Text should be horizontal. Authors order (Hansgirg 1892, 1899 ...) on page 21 does not follow alphabetic order or priority of year. Paper 1 "The checklist of photosynthetic euglenoids (order Euglenales) of the Czech Republic: ecology, taxonomy, distribution" represent time-consuming work with the checklists of algae and their taxonomic revisions. Josef summarizes previous taxonomic works and states impressive number of 284 species of Euglenophytes on the territory of the

Czech Republic. I think that examples of very rare or taxonomically important species could be added here in several plates. Figure 3 (page 114) illustrates morphology of *Trachelomonas bituricensis* var. *lotharingia*. It would be convenient to illustrate *Trachelomonas bituricensis* as well and mark diagnostic features. I especially appreciate chapter Discussion (pages 130-140, Paper III). It is a well-written part of this paper and shows Josef's taxonomic experiences. According to Material and Methods (Paper V, pages 169-170), environmental variables such as temperature, pH, conductivity, concentration of ammonium and phosphates were measured. A robust multivariate analysis would be suitable for interpretation of relationship between species and measured environmental variables.

I would like to put some questions to Josef:

1. Did you isolate some strains of studied Euglenophytes?
2. If yes, why did not you study these strains using molecular methods?
3. What is your opinion about "Finlay theory" with respect to Euglenophytes? Are Euglenophytes ubiquitous or not?
4. Could you mention some example of subjective influence, which leads to incorrect identification?
5. Does Figure 1 (page 128) show only one specimen or more?
6. Why did not you analyze relationship between species and environmental variables using multivariate analysis in Paper V (e.g. Canoco)? Was anything wrong with environmental data?

Despite my several minor comments, I consider this PhD thesis very good. Josef proved that he is able to write scientific text and represents young and perspective phycologist/specialist in the taxonomy of Euglenophytes. I recommend PhD committee at the Faculty of Science, University of Bohemia in České Budějovice to accept submitted PhD thesis.



Doc. RNDr. Petr Hašler, Ph.D.

Faculty of Science, Palacký University in Olomouc

In Olomouc 11. 2. 2019



UNIwersytet w Białymstoku

Wydział Biologiczno-Chemiczny

Instytut Biologii

ul. K. Ciołkowskiego 1J, 15-245 Białystok tel. +48 85 7388224, +48 85 7388226
tel./fax. +48 85 7388414, e-mail: biologia@uwb.edu.pl

Białystok, 20th February 2019

Dr hab. inż. Magdalena Grabowska
Zakład Hydrobiologii
Tel. +48 85 7388392
magra@uwb.edu.pl

Review of PhD thesis of Josef Juráň

Dear colleagues

I was asked to report on the PhD Dissertation titled

"Floristic-taxonomic study of the Euglenophytes: Implications for their ecology, distribution and practical protection"

which was prepared by Mr. Josef Juráň. I find the presented thesis shows a set of original, new and important results, and has met the standards that one should uphold for a PhD thesis.

My detailed comments:

The thesis is based on 6 papers. Five of them have been published in four *journals* listed in the Journal Citation Reports from 2016-2018. The 6th paper is still in the form of a submitted manuscript to *Biodiversity and Conservation*. In two papers, the PhD student is the only author, and in other two, the first author. All papers were well-written and clear. In each of them the PhD student's important contributions were well-documented.

The dissertation consisted of 3 main chapters beginning with a 21-page introduction on the current state of knowledge about euglenoids. This part contained important synthetic information on euglenoids such as cell structure, nutrition, phylogeny, taxonomy, ecological role, inhabited biotopes, and distribution. The introduction identified a knowledge paucity and gap in this branch of science, e.g. problems of the euglenoid taxonomy and phylogenetic relationships. The last part of the introduction distinctly stated objectives and content of the thesis. The aim of this thesis was to contribute to knowledge about the distribution of euglenoids and their ecology together with possible overlaps with practical nature protection.

The first chapter titled "Euglenoid distribution" was comprised of three papers. PAPER I presented the compiled checklist of 284 photosynthetic euglenoids reported from the Czech Republic and the ecological characteristics for each taxa. The two other papers contained well-documented records of two rare species belonging to the *Trachelomonas*

genera. The great advantage of PAPER I is the skillful combination of numerous literature data with the PhD student's commitment for floristic surveys across the Czech Republic. Such a bi-directional approach to this topic made it possible to enrich and verify data on the euglenoid distribution on a local level. PAPER II and PAPER III both highlight new information about the global distribution of rare species *Trachelomonas bituricensis* var. *lotharingia* and *T. saccasii*. In addition, PAPER III proposed strategies to obtain further information about the global distribution of this group of algae. In my opinion, the authors rightly suggested using selected species with rare distribution as a flagship species for understanding euglenoid biogeography. The second chapter titled "Euglenoid ecology" was comprised of two papers. PAPER IV presented very interesting results on the detailed morphological study of the *Trachelomonas caudata* group. The ultrastructure analysis of loricae led to the classification of four other species of *Trachelomonas* and a form of *T. caudata* to the one "caudatae complex". PAPER V presented euglenophytes as a constant main component of microalgae in periodic clay-pit pond in eastern Poland. The third chapter titled "Practical conservation impact" was comprised of one paper. PAPER VI summarized data from the published Red Lists from European countries and indicated poor knowledge about biodiversity of microalgae. The authors proposed a Red List of microalgae, using euglenophytes as a model group.

Euglenophytes are a very diverse and interesting group of microalgae. Many of them can be used as good and fast indicators of environmental quality. Therefore, I have two questions. The first of them is: What environmental factors can affect smaller sizes of *Trachelomonas* lorica in freshwaters and what are the advantages and/or disadvantages for these microscopic algae? The second question is connected with bioindication: What groups/species of algae were used for the evaluation of potential threat or environmental changes in studied habitats/localities?

This thesis is a critical, reliable and practical assessment of the state of knowledge on microalgae with particular emphasis on photosynthetic euglenoids. I agree with the author's suggestion using term little-known species rather than rare species for microscopic algae is more useful because of lack of our knowledge about them, the most often causes taxonomic uncertainty, distributional uncertainty, and/or ecological uncertainty. In my opinion, the thesis contributed to greater knowledge of euglenoids diversity, ecology and distribution. A great work was done by the PhD student. The practical aspect of algal protection in PAPER VI is worth highlighting. The author thoroughly reviewed and skillfully utilized available phycological literature data. I see the importance of these papers for the phycology. All the stated objectives for this work have been fully implemented.

Mr J. Jurán has prominently shown an ability for creative scientific work. In summary, I find that the thesis is definitely up to the standards that one should uphold for PhD thesis. I recommend the thesis to be defended.

Sincerely,

A handwritten signature in blue ink, consisting of a stylized, cursive script that appears to be 'J. Jurán'.