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Report on the PhD Thesis of Martin Fikáček, Supervisor: Jakup Prokop, PhD

Sir,

here, I provide an evaluation of the PhD thesis entitled "Taxonomy, phylogeny and fossil record of selected groups of water scavenger beetles (Coleoptera: Hydrophilidae)", presented by Martin Fikáček. The thesis consists of two parts, A - Fossil record of the Hydrophiloidae with 4 publications; and B - Terrestrial Hydrophilidae with 9 publications. Thus, 13 publications have been produced in fulfillment of requirements to obtain the PhD.

First of all, I strongly recommend to accept the thesis. I do consider the work presented suitable for defense, and consider the quality fulfills the criteria to obtain the PhD.

I will focus on part B - Terrestrial Hydrophilidae, as this is more in my area of expertise, and because my co-opponent, Prof. Engel, is one of the World's finest experts on fossil Coleoptera.

- 1) **Number of papers.** The amount of work summarized in the thesis is amazing, 13 papers, all of them with M. Fikáček as first author, clearly show that M. Fikáček has established himself as an independent researcher with a well-defined area of research expertise. He shapes global knowledge in his preferred group, fossil and extant fauna likewise. A total of 13 papers is, as far as I can say, far above average.
- 2) **Journals, co-workers.** The journal choice is adequate and balanced, with a number of papers in international journals (9, 2 of them bookchapters) and 4 papers in a local, yet well-acclaimed journal (*Acta ent. Mus. nat. Pragae*). The two bookchapters (*Water Beetles of New Caledonia*, for which I was co-editor) went through one of the world's hardest review processes and depth of review can be compared with *Systematic Biology*! The co-workers are internationally respected researchers, including the "old leaders" in Hydrophilidae research.

- 3) **Terrestrial Hydrophilidae: Achievements (i).** 32 new species: 1 new species of *Cyrtonion* (Congo); 9 spp.n. of *Oosternum* (Neotropical); 3 spp.n. of *Kanala*, 2 spp.n. of *Aculomicrus*, 3 of *Psalitrus* and 1 of *Dactylosternum* (all in New Caledonia); 8 spp.n. of *Sacosternum* (Neotropical); 5 spp.n. of *Cetiocyon* (Suriname and New Guinea). This is, in times of rapidly deteriorating taxonomic expertise, a good step into the right direction, which I salute. Diversity of genera and geographical regions considered reveal M. Fikáček as a researcher with global knowledge of his study group. This is very important to be able to see the bigger picture and eventually design research that goes beyond taxonomy. **Achievements paper by paper; (ii).** Highly disjunct distribution of *Emmidoloium excavatum* documented, its enigmatic morphology figured and discussed in a comparative context. **(iii).** Diagnostic and general characters for *Cyrtodion* clarified and illustrated, along with global distribution. **(iv).** New World *Oosternum* revised taxonomically (3 papers), species groups delineated, characters and ranges illustrated. **(v).** New Caledonian *Kanala* revised taxonomically, internal and external morphology illustrated in great detail, ranges illustrated, phylogenetic relationships inferred based on morphology and discussed in detail. **(vi).** New Caledonian Spaeridiinae reviewed, morphology illustrated in great detail and ranges illustrated, relationships and biogeography discussed. **(vii).** Neotropical *Sacosternum* revised taxonomically, characters and ranges illustrated; phylogenetic relationships inferred based on morphology and discussed in detail. Association of some *Sacosternum* species with army ants discussed and mapped on phylogenetic tree. **(viii).** *Cetiocyon* discovered in the Neotropical region and taxonomic revision of the New Guinean species. Characters and ranges illustrated; phylogenetic relationships inferred based on morphology and discussed in detail.
- 4) **Quality of research** is high, above average to excellent, the texts are well-written, especially so for a native speaker. The illustrations are of good to excellent quality. Methods used are adequate, especially dissections and illustrations of internal structures and endoskeletal structures where adequate. Methods here were digital imaging; SEM; microfotography and line drawing, in part computer aided. Methods spectrum is timely. Analytical methods applied were adequate, thus very good. It is particularly noteworthy that most of the papers included are already published, a highly commendable approach. The candidate has, with this thesis, established himself in the global taxonomic community. While a lot of the research remains descriptive alpha-taxonomy, the very necessary first step onto which to build analytical work, there are good indicators in the thesis that M. Fikáček's interest goes further. There are some fine, alas small, phylogenetic analyses presented, one already with the aim to trace character evolution.

Comments. The 17 page introduction to the terrestrial Hydrophilidae first addresses habitat shifts in the Hydrophiloidea, then in Hydrophilidae in a phylogenetic and functional morphological context. The text is well written. Some of the wording should have been better supported by literature references (e.g. p95, 1st sentence: "The hydrophiloid lineage is undoubtedly derived from the ancestor having terrestrial adults...", which might well be so - as for example implied by Hunt et al., 2007 (10.1126/science.1146954). It follows a discussion of habitat types, which could have used a discussion of Jäch (1998, WBOC II: 25-42) who provided an in-depth treatment of this issue. It follows an introduction to the Sphaeridiinae as such, the terrestrial Hydrophilidae, with summary of apomorphies suggested to date, summary of the distributional ranges of the tribes, and then an outlook on future directions in terrestrial Hydrophilidae research. Here, Martin Fikáček suggests that the group, with its habitat specializations and presumably limited dispersal capabilities (but see wide range e.g. of *Emmidolium excavatum*) was a good study system for the future biogeographical analyses he plans as his longer-term research goal.

In summary, I should like to suggest that this thesis is a positive example for modern taxonomic work, I had surprisingly little to criticize and recommend the candidate highly. The results should all be available online, this is especially true for the habitus photographs. Wikispecies would be the adequate repository.

With kind regards,



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