



Assessment of the PhD dissertation

**Phylogeny of parasitic wasps of Torymidae (Hymenoptera: Chalcidoidea) and evolution of their life-strategies**

*Author:* Petr Janšta

*Referee:* Josef Bryja

The PhD thesis of Petr Janšta deals with phylogenetic analysis of chalcid wasps, with the main interest in the family Torymidae. It has a standard format, consisting of five papers, four of them already published and the last one more or less ready for submission. These papers are supplemented by general Introduction and short Conclusions.

After reading the thesis, it seems clear that Petr became one of the best (if not the best) specialists in the taxonomy and phylogeny of parasitic wasps of the family Torymidae in the world. He is recognized as important member of international consortium working on the phylogeny of chalcid wasps, as evidenced by his co-authorship of Papers I and II. Especially the Paper II, i.e. the phylogenetic analysis based on combination of 233 morphological characters and ribosomal genes in cca 300 taxa of Chalcidoidea, will surely become the basic source of information about phylogenetic relationships within this important group of insects for next generation(s) of entomologists. I have just two comments or questions concerning the first two papers included in the thesis. (1) It seems that the mapping of biological traits on the trees is largely redundant between Paper I (at Fig. 9) and Paper II (at Fig. 11). However the topology of trees is not identical between the two papers and it can change the implications from mapping the morphological and life history traits. Could the author identify such discrepancies between the two papers and comment on them (I could not find this discussion in Paper II)? Which figure (Fig. 9 in Paper I or Fig. 11 in Paper II) is therefore more realistic and why? (2) I think that very interesting question concerns the evolution of metallic coloration. It is a pity that there is no analytical reconstruction of the ancestral coloration in Paper II (which is in contrast to analyses in Mesquite in Paper V). In any case, it is clear that a metallic colour has been developed or lost in numerous lineages. Can the author guess, which of these two possibilities is more probable and why?

In PhD dissertations composed of collaborative papers, the applicant usually specifies the amount of work that he/she has done on particular outputs. Here, it is not clear how important was the contribution of the applicant to the first two papers. For example, Petr is the last author of the Paper I, which suggest that he coordinated all data collections and analyses. But it is probably not the case, as mentioned in the Authors' contribution section of the manuscript (where it is just the vague statement "PJ and many others performed the experiments"). In the Paper II, it is even less clear. So, what was the work done by the applicant on these generally very good papers (just providing material or data or also some important part during data analyses and redaction of the manuscript)?

The most valuable part of the thesis performed clearly by the applicant is the detailed phylogenetic analysis of the family Torymidae with the reconstruction of the evolution of their life strategies (Paper V, whose title correspond to the title of the thesis) and two papers describing new taxa within this family (i.e. "by-products of the phylogenetic analysis" as stated by the thesis' author). The two papers from Zootaxa provide clear evidence that the author is able of precise and detailed taxonomic work (which is not very common in today's zoology and I really appreciate it), and I have no comments to them. The Paper V is still unpublished manuscript of good quality, and I have only few comments that could potentially help to increase its information content. (1) The authors used five genes for phylogenetic inference, but they do not provide the separate phylogenetic analyses of separate genes, i.e. it is not clear whether gene trees provide similar topology. Because they combine both mitochondrial and nuclear sequences, it would be good to test that the topology of both gene types represents the real species tree. (2) In the last part of Results (Characters mapping), there is no



description of results in the text at all. I find this part very interesting and the description of Figs. 4 and 5 should be more developed. The reconstructions of ancestral character states are very sensitive to taxon sampling. It would be also useful to discuss how (presumably) incomplete taxon sampling can change the outputs of these analyses.

I should also comment on the general organization of the thesis. It is very unusual (at least among theses that I reviewed or supervised) that the thesis begins with the Aims, even before general Introduction. The Introduction should identify the "white spots" in the research area and in the next step the objectives of the thesis should be defined with the aim to fill the gaps in the current knowledge. Here the Introduction contains numerous references to two published papers (I and II), which makes difficult to understand what the aims of the thesis really are. I would also change the order of papers, putting the taxonomic papers at the end of the thesis, following three phylogenetic papers. Also, some parts of the Introduction are not organized in a logical way, e.g. the very wide chapter "Biology and history of classification of Chalcidoidea and position of the family Torymidae" (p. 12) is followed (p. 17) by a chapter "Phylogenetic position Torymidae within Chalcidoidea". In general it seems that the Introduction (as well as very short Conclusion part) were written in a lack of time, but it seems to be very widespread fact in numerous PhD theses at Czech universities (which is not good in my view). For example, what I was missing is the general reason why to study the phylogeny of this group of insects. I believe that there are numerous answers to the question, why the chalcid wasps are important in fundamental and applied biological research (as models), but the reader of the thesis has the problem to find this information.

Because I am just curious, I would like to know also the opinion of the author on following questions:

(1) Are current Torymidae monophyletic or not? (i.e. there is discrepancy between purely molecular genetic phylogenies and combined genetic-morphological study). And why the two approaches differ?

(2) What is the author's estimate of undescribed taxa of chalcid wasps (e.g. within Torymidae), especially at the level of genera and higher. In other words, how frequently we can expect the findings like in Papers III and IV, i.e. the description of new genus with several new species. And in which areas of the world do you expect most new discoveries?

(3) Based on data in Paper V, the family Torymidae is widespread in all biogeographical regions. Is this pattern common in most families of Chalcidoidea or is it an exception?

**Conclusion:** The applicant showed that he is able to define meaningful aims, collect appropriate data and analyse them by suitable methods. He showed that he can perform scientific research at international quality level, which is the necessary prerequisite to become a PhD. I believe the papers in the thesis will become one of the milestones in phylogeny of chalcid (and especially torymid) wasps, which fully justifies defending it, and after successful presentation of the results **I suggest Petr Janšta to get a PhD diploma** of the Charles University in Prague.

In Studenec 15th of April, 2014

Doc. Mgr. et Mgr. Josef Bryja, Ph.D.