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Review & overall assessment of the Ph.D. thesis submitted by Kristýna Vazačová, "The evolution of dispersal traits in plants" at the Charles University in Prague, Faculty of Science, Department of Botany, Prague in 2014.

The submitted Ph.D. thesis is a compendium comprising several chapters, a general introduction and four manuscripts formatted to be published (or already published) in scientific journals. Finally there is a short conclusion.

The overall level of the thesis is standard. The outcome of the thesis is based on intense field work followed by time-consuming lab work. The applicant clearly demonstrated her ability to collect data in the field and in the lab, to use appropriate methods and to put the results in the broader context and framework of dispersal ecology in fragmented landscapes. I especially appreciate following aspect of the thesis: (1) Author studied many aspects of plant dispersal evolution (changes in dispersal ability of endemic plants, correlation between dispersal traits and species distribution, evolutionary potential of plant dispersal traits). (2) The thesis directly determined dispersal abilities of seed/fruits.

Introduction is rather minimalistic, theoretical framework of the study is described on less than five pages. I could imagine that some topics could be introduced more thoroughly at the beginning of the thesis, e.g., evolution of (dispersal) traits and how phylogenetic signal in traits could be tested. The other parts of the Introduction (pp. 18-22) are largely redundant with Conclusions and are structured in paper-by-paper manner instead of uniting all the concepts, results and discussion.

Three chapters are already published or accepted for publication in international journals; the last part is also in a form of a scientific paper. Since the three parts already underwent through journal's review process my questions are either general or they are concerning the fourth paper of the thesis. It is obviously the weakest part of the thesis.

Specific questions/remarks:

(1) Papers 2 and 3 are based on relatively small number of species examined (54 species are around 2% of the flora). However, most of the results are interpreted and discussed as being general conclusions for the evolution of dispersal traits in the island system. I completely agree that it was not easy to obtain such detailed dataset and that you must make a compromise. **Actually there is no explanation how the species were selected for the study.** Completely randomly or did you try to stratified your selection according to any criteria? I believe that better

representation of the flora (i.e., higher number of species included in the analyses and/or better, i.e., stratified, selection of the species) would enhance explanatory power of you results.
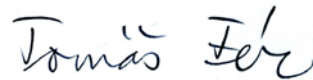
(2) In Paper 2 dispersal traits for non-endemic species were measured only on plants from island population. In this paper you test the hypothesis of Carlquist (1965) that island species tend to lose their dispersal abilities (and which you finally falsify for your dataset). However, in case of cladogenesis of endemic species from non-endemic congener it might be the case that **also non-endemic species are living on islands long enough to lose their dispersal abilities**. Could you discuss this topic? And more generally – what is known about differences in dispersal abilities among populations in widely distributed species?

(3) Why was **phylogenetic correction (PC) calculated differently** in Paper 2 and Paper 3?

(4) Paper 4 is quite short, especially Results sections should include more detailed description of trait values in particular groups/species. Only results of analyses are presented, **primary data (trait values determined for particular species) are missing** and the reader cannot follow the discussion properly if it is not presented which groups/species have which values of particular traits.

(5) In Paper 4 you calculated phylogenetic signal in dispersal and persistent traits. To conduct any kind of this analysis you should have properly resolved evolutionary hypothesis with supported groups that can be used for such analysis. However, this is not the case of the tree presented at Figure 1. Was exactly this tree used for estimation of λ and D? If yes than results are highly influenced by the fact that majority of groups in this tree are not really supported and that there is a high chance that the correct tree looks differently. Generally, **is there any approach how to estimate λ that takes phylogenetic uncertainty into account?**

(6) In Paper 4 you present phylogeny based on data from two independent genomes. However, you nowhere mention **how congruent were results based on analyses of separate cpDNA and ITS datasets**. Combining datasets coming from different genes or even genomes without any kind of inspection of their (in)congruence is generally wrong.

(7) For the phylogenetic analysis in Paper 4 you obtained DNA data from NCBI GenBank. **How do you know that determination of sequenced species was correct?**

(8) In Paper 4 you applied tests for niche conservatism, however, with almost no explanation why this was done. Could you **explain the concept of niche conservatism** and show how it is connected with variability in measured dispersal traits?

(9) Finally, I have several (small) remarks to the Paper 4:

- Why just GTR+G+I evolutionary model was used for analysis? Have you done any test for most suitable model prior to analysis?

- Is λ for achene height significant (Table 3, p. 149) and how it was tested?

- I do not agree with your statement that clades within woody *Sonchus* are well supported (p. 134 and 135). Only clades with Bayesian posterior probability values over 0.95 should be treated seriously (i.e., supported). There are just

two such clades (*S. filifolius*, *S. leptocephalus*, *S. radicatus*, *S. tectifolius* and *S. acaulis*, *S. congestus*).

- How was standardized contrast calculated? By hand?

- Why do you think that *Reichardia* is not monophyletic (p. 134)?

- Phylogenetic analysis relies on automatic alignment results or any manual corrections of the alignment have been done?

- Why do you think that *Sonchus* spp. can easily change their growth form (p. 136)?

The study of Kristýna Vazačová brings valuable insight to the evolution of dispersal traits of plants inhabiting oceanic islands. It fulfils the criteria necessary for obtaining the Ph.D. degree at the Charles University in Prague. I consider it suitable for defence.

Praha, 16th September 2014

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