



Technical University of Munich

Technical University of Munich
80290 München · Germany

Prof. RNDr. David Storch
Chairman of the Board of Examiners
Charles University Prague
Albertov 6
12843 Praha 2
Czech Republic



School of Life Sciences
Weihenstephan

Department of Ecology and
Ecosystem Management

Chair of Restoration Ecology

Head of Department:
Prof. Dr. J. Kollmann

Emil-Ramann-Straße 6
85354 Freising
Germany

Tel +49.8161.71.4144
Tel +49.172.2745010
Fax +49.8161.71.4143

jkollmann@wzw.tum.de
www.roek.wzw.tum.de

Review PhD thesis Jan Čuda 2017 – Charles University Prague

Freising, 17 September 2017

The cumulative PhD thesis of Jan Čuda (Charles University Prague) has the title *Factors associated with invasiveness in the genus Impatiens: interaction of species traits, competition and environment*. It is focussed on plant traits and interactions controlling species invasions, and its backbone are four first-author publications in international journals. In addition, the candidate lists two manuscripts in revision, and two other publications produced during the 7 years of his PhD studies. The articles are published in well-established ecological journals (*AoB Plants* ISI Impact Factor = 2.24, 2x *Biological Invasions* IF = 2.47, *Diversity and Distributions* IF = 4.39, *Perspectives in Plant Ecology, Evolution and Systematics* IF = 3.12) Thus, the publication profile of the young researcher is strong, and the publications covered by ISI Web of Knowledge have attracted 19 citations so far (2014–2017). The publications are based on collaborative research with at least four co-authors, while five papers are first-authored. The contributions of Jan Čuda to the design, data collection, analysis and writing of the publications are substantial, as explained on p. 92. It is almost pointless to evaluate these peer-reviewed publications that are mature pieces of original research.

The topics of the four publications selected for the PhD thesis are presented within a theoretical framework set out in the introduction and reflected by the synthesis and conclusions chapters. These parts of the thesis cover about 16 pages and they are supported by a substantial list of references. Here, fundamental concepts, challenges and the essential results are summarised relating to plant traits, competition and plant invasion. Both the introduction and the synthesis show that Jan Čuda has an advanced understanding of the ecological and evolutionary processes that drive plant invasions, and he is able to point out directions for future research. However,



Technical University of Munich



School of Life Sciences
Weihenstephan

Department of Ecology and
Ecosystem Management

Chair of Restoration Ecology

Prof. Dr. J. Kollmann

these parts of the thesis look a bit short and add few additional points to the information delivered by the publications. The overall sequence of topics is fine, the links between the different parts are clear, while in the non-published parts of the thesis there are several very condensed sentences that would need more work to allow a critical understanding as indicated in the annotated thesis. Another shortcoming of the thesis is that potential applications in management of plant invasions, in ecological restoration and conservation are not addressed.

Content

The PhD thesis reports on a series of phylogenetically controlled studies in comparative ecology with the aim to identify plant traits that determine invasiveness. The candidate has used 10 species for his first publication, and one native and two invasive *Impatiens* for the three other publications. The main results are that (i) juvenile traits are more significant than adult ones to explain invasiveness; (ii) commonly planted species naturalise more frequently; (iii) there is an overlap in the ecological niches of native and invasive species leading to interspecific competition, while coexistence is possible when different microhabitats are available; (iv) competition is more important for plant performance and fitness, while environmental constraints determine completion of the life cycle; and (v) the tallest *Impatiens* species is most competitive under all experimental conditions, with highest abundance in riparian sites. These are all substantial and highly interesting findings that will advance the field of invasion ecology.

Strengths of the thesis

Overall the thesis has a suitable structure, it is written in adequate English, the references are carefully selected, there are almost no formatting mistakes, and it is well illustrated (e.g. the conceptual diagram in Fig. 1, and photos and maps of Fig. 2). The four publications are well-framed by the introduction and synthesis chapters. The abstract is informative, and the introduction is well-argued based on a good number of references. The candidate has formulated a series of challenging questions based on current research in invasion ecology. The genus *Impatiens* is a suitable study system with several native, cultivated and invasive alien species that have received considerable attention during the past 20 years, and the innovative niche of the thesis is well described. Another strength of the thesis is the combination of different methodological approaches within the four studies. I particularly liked the nice experimental design and the



high number of replicates in all studies. There is an excellent summary of the key questions and most significant results of the studies in Table 2 (p. 77). Overall, this is the rare case of a cumulative PhD thesis where the combination of the constituting publications actually creates a higher level of understanding than the sum of the individual papers.

Weaknesses of the thesis

The species number (10) is fine for the comparative trait study, but relatively low for the niche comparison (3). Thus, there are limitations to generalise the results as already acknowledged in the introduction (p. 9). The results are remarkable but not unexpected. The introduction and synthesis are rather short. Some sentences are almost too brief to be understood, and several arguments must be expanded, e.g. in Section 6.5. The different species orders in Figs. 1 and 2 are confusing. For the various photos it needs to be mentioned whether or not Jan Čuda is the author. The subtitle of the conclusions (“current state of invasion and outlook on future trends”) sounds a bit misplaced, and this final section of the thesis still looks more like an advanced draft since it is rather short and open-ended. Moreover, it is not always clear how the citations work: Is the reported point a finding of the PhD student or does it stem from the reference cited? – The English is well done, while (as a non-native speaker) I could spot some mistakes and typos. The author contributions are named for all studies, but this list is neither signed by the main supervisor (as requested in the ‘thesis requirements’ of Charles University) nor by the co-authors.

Questions

1. How comes that the ‘wetland species’ *Impatiens glandulifera* was not more affected by soil moisture (p. 79)?
2. Are there any observations of herbivory or plant diseases among the study plants?
3. Why is life cycle completion more affected by the environment and fecundity more by competition? What are the mechanisms resulting in analogue effects on plant naturalisation and plant invasion (p. 80)?
4. How can the *Impatiens* plants produce thicker cell walls with less cellulose (p. 80)? What type of tissue does constitute most parts of *Impatiens* stems?



Technical University of Munich



School of Life Sciences
Weihenstephan

Department of Ecology and
Ecosystem Management

Chair of Restoration Ecology

Prof. Dr. J. Kollmann

5. Why should *Impatiens glandulifera* spread further from riverbanks in tributaries than in the main river? How is this related to its habitat requirements (p. 81)?
6. How can the thesis conclude that congeneric comparisons are useful tools to identify successful invaders when no alternative method is tested?

Conclusion

The topic of drivers of plant invasion within the genus *Impatiens* is suitable for a PhD thesis, and the overall scientific quality of the thesis is very good. The core findings are diverse and substantial, they are based on advanced theoretical concepts, manipulative experiments and productive collaborations. The thesis contains an impressive amount of published results with potentially high impact. Thus, I have no doubt that it is suitable for a defence and that its quality fulfils the criteria necessary for obtaining a PhD degree at Charles University in Prague.

Kind regards,

(Prof. Dr. J. Kollmann)