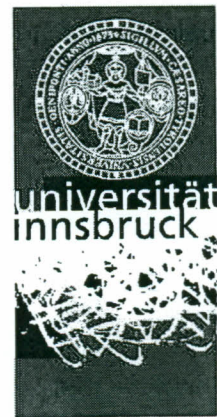


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Prof. Karel Prach
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Innsbruck, 11/10/11

Dear Prof. Prach,

I am pleased to send you the review of the PhD thesis:

Ecology of *Rumex alpinus* –retrospective studies using annual growth markers on
rhizomes

submitted by Petra Št'astná

The PhD thesis of Petra Št'astná contains three papers, the first one published in *Perspectives in Plant Ecology, Evolution and Systematics* (2010), the second one submitted recently and the third one was prepared as a manuscript and will certainly be published shortly. The three papers are preceded by a general introduction on (i) the importance of clonal plants in alpine ecosystems, (ii) the methods of chronology, especially herbchronology, (iii) the general ecology of the species and on (iv) the studied area (Štiavnica Valley, Nízke Tatry, West Carpathians). Short general conclusions form the last chapter of the thesis.

The main aims of the studies were to investigate taxonomy, morphology, population biology, genetics, chemistry, physiology and ecology of the clonally growing tall

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herb *Rumex alpinus*. Secondly, the growth of the species was studied in more detail comparing individuals along an altitudinal gradient with the focus on optimal vs suboptimal growth conditions. The third approach analyzed the effects of snow duration on the growth of the species.

The first paper reviews the bibliography on *Rumex alpinus* in a very comprehensive way. Petra Št'astná reports also her own data on LAI, vertical distribution of dry mass, relationship of annual increment of the rhizome and dry mass of the shoots, observations on leaves as well as the effects of light intensity and temperature on germination in this paper. Is there any relationship between seed production and rhizome growth? In the view of functional concepts, how can *Rumex alpinus* be defined? What general strategy does the species have? Why can it form monodominant stands?

The second paper comprises a retrospective study along an altitudinal gradient, analyzing individuals from seven sites by means of herbchronology and observing morphological markers on rhizomes. On forest clearings the most vigorous growth occurred. What are the explanations for that? Does population structure change along the altitudinal gradient and if so, what are the consequences for the communities? Are there life cycle changes along the altitudinal gradient?

The third paper reports on a snow accumulation experiment in 1989 and on the consecutive retrospective analyses of rhizomes using pre-treatment growth (1987-1989) and post-treatment growth (1990). Number of leaves per year was found to be correlated with snow cover and vegetative growth was affected by short growing seasons. What are the consequences of snow cover duration for the reproductive output? How will *Rumex alpinus* react to global warming and season prolongation?

All in all the papers are scientifically sound and the statistical analyses are well done. The candidate shows a constant effort on augmenting the knowledge on morphology and ecology of *Rumex alpinus*. It was a pleasure to read the results of these expansive studies on a clonally growing tall herb, performed as long-term

study. The PhD fulfills general standards. She also presented the results at several national and international meetings. In addition to the scientific standing, Petra Št'astná has a comprehensive practical experience in the field of nature and landscape protection and Nature Park administration. She clearly showed her ability to solve scientific questions independently and presented good scientific contributions.

Sincerely

A handwritten signature in black ink, appearing to read 'B. Erschbamer', with a long, sweeping horizontal stroke extending to the right.

Univ.-Prof. Dr. Brigitta Erschbamer

Review of the dissertation thesis entitled „Ecology of *Rumex alpinus* – a retrospective studies using annual growth markers on rhizomes“ by Petra Šťastná

Rumex alpinus is a noxious weed in the high Sudeten Mts. of the Czech Republic that invades disturbed sites in which it can persist for many decades. Ecology of the species has been widely studied, namely in the Krkonoše Mts., but still there are gaps in the knowledge of its growth response to various environmental signals. In this context, Petra Šťastná presents an interesting study on the species performance in various natural and manipulated conditions. By employing herbchronological approach, Petra has been able to reconstruct the growth pattern of the plants and infer the major environmental drivers beyond. Although I am not experienced with the techniques that use the annual growth markers, I agree with Petra that herbchronology is a useful tool for studying plant growth in a retrospective way. And this is, in my opinion, the important contribution of this thesis.

The thesis consists of five major sections, i.e., General introduction, three chapters with co-authored manuscripts, and General conclusion. The General introduction is rather short, written on eight pages of the text. However, since the first manuscript (Chapter 1) is a review paper, it largely substitutes for an introduction to the subject. And as such, I find the short General introduction just appropriate. Still, I would have a comment here, the section called Ecology of *Rumex alpinus* basically describes objectives of the three papers that are included in the dissertation, rather than providing a true account on the ecology of the species.

As already mentioned earlier, the first chapter contains a published review on the biology of *Rumex alpinus*. I wish to say that I like very much the idea to start the thesis with such a paper. It is well written and demonstrates nicely that Petra is capable of summarizing available knowledge about the subject. The other two chapters are original manuscripts, one of them under revision at the time of thesis submittal (unfortunately, the journal to which the ms was submitted is not provided) and the other I would characterize as an advanced draft of a paper.

Since the first paper has already been revised during the review process and, moreover, I have very little experience with the species itself to add anything to the subject, I will rather concentrate myself on commenting on the two manuscripts, starting with the Chapter 2. The manuscript describes a temporal variation of growth performance of *Rumex alpinus* along an altitudinal gradient. It is a standard paper and I believe that it will be accepted for publication. Nevertheless, I wish to point to some issues that I have found to be unclear.

– I am afraid that circularity is involved in the hypothesis no. 1 of the altitudinal study – i.e., first you wish to determine the optimum site for *Rumex alpinus* using morphological markers and you follow with a prediction that the plants will grow and flower more vigorously at the optimum site. Actually, what would be the expected pattern of the plant performance along the altitudinal gradient and how do your data fit to this pattern?

– I also have a question regarding the hypothesis no. 2 – why should variation be higher in less favorable sites than in the optimum site, which mechanism should be involved to produce such pattern?

– The clonal fragments from 1170 m are apparently significantly younger than fragments from many other altitudes. Since significant temporal trend was found for many variables, I

wonder how could have the younger age of the 1170 m fragments affected the results of the growth performance.

The other manuscript analyzes the response of the species to natural and artificial snow cover. Results basically confirm the expected pattern that those variables that limit the growing season affect the performance of the plants. I have a few comments and question also here.

– You admit that some rhizomes might represent the same genet (Chapter 2). Why then was the sampling confined to such a small area as 2m²? Although you write (p. 82, second paragraph) that “.....for each clone”, I believe that you wished to say “for each clonal fragment” (see also Fig. 2). Or do you actually have an idea about the genetic structure of the *Rumex* stands? Is there any knowledge on the spatial arrangement of the genets? How could the genetic structure of the population have affected your results? This comment applies to the previous paper as well.

– If I understand well, the rhizomes were collected from two plots (treatment vs. control) in the snow accumulation experiment. Then the fragments are pseudoreplicates, in the same way as they were in the other measurements. I wonder why the analyses did not reflect the nested design, such as in the snow-bed vs. control data (Chapter 3) and the altitudinal study (Chapter 2)?

The General conclusion chapter is quite short (two pages) and represents a summary of the results rather than anything else. Even though Petra did not collect a huge amount of data, there are some interesting findings in the two papers. So what I miss here is an account that would put the results into a more general context of, for instance, the alpine plant ecology. Also, the section entitled Perspectives in this final chapter is rather weak. Petra attempts to formulate possible directions for future studies, but some of them actually only lead me to ask, why she did not perform such a study (i.e., the repeated measurements from the snow-bed site) or what would be the point of that particular research (i.e., the suggested comparison of growth between *Rumex* and the surrounding trees).

To conclude my review, I cannot escape the feeling whether the thesis has not been submitted somewhat prematurely. I wish to make it very clear at this point that I do not blindly count the number of published papers (irrespective of the type of the journal) in the thesis. What I am trying is to evaluate the original scientific input of the candidate. The first paper is a review, well written but still a review of previously published works. The third paper analyzes data collected in 1989, which is many years before Petra started her dissertation project. This means that the idea of that research, design, and data collecting were made by the co-authors, whereas Petra contributed with data preparation, preliminary analyses, and writing (as stated in the thesis). So we are left with a single paper (Chapter 2) to demonstrate the potential of the candidate to conduct her own scientific research. If that is enough I truly do not know. The manuscript indicates that Petra did her field work seven years ago and I wonder whether more research was done over those years – I have noticed reference to unpublished data in the text but cannot infer what that means. So I have been wondering since I browsed through the thesis for the first time, why more original work has not presented.



Petr Sklenář, PhD.

Prague, 16 October 2011

I have a couple of specific comments on the thesis, which, however, need not be discussed during the defense:

I simply must comment on the title, the phrase "a retrospective studies" probably is not correct. In general, some parts of the text would benefit from corrections made by a native speaker.

Chapter 2

The graphs are not always easy to read due to poor reproduction. But as I can see in Fig. 3, the 1170 m site spans period 1996-2003 for most parameters whereas 1997-2003 for the number of buds. Why is this so?

Chapter 3

The species name *Pedicularis reticulata* (p. 77) should be corrected.

Fig. 5. I believe that you wished to refer to Fig. 6 in the caption. Then how did you select the climatic variables to be graphed when more than one significant correlation was found? For instance, segment width correlates with both temperature and precipitation (different months) yet you selected August precipitation. Moreover, the control and snow-bed plants usually correlate to different variables.

Fig. 6. Are values of the correlation coefficient indicated on the Y axis?

Fig. 7. This figure is kind of lost. There is a reference to it in the text (p. 84) and caption of Fig. 5, but as far as I understand the text refers rather to Fig. 6.

The final paragraph (warm spells may affect snow cover, but we did not find any effect of winter on the plants because there were no warm spells in the winter) is truly redundant and I would suggest to delete it from the ms before it will be submitted to a journal.