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Dianthus plumarius subsp. blandus – Monitoring under extreme conditions

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Abstract

Dianthus plumarius subsp. *blandus* is a narrow endemic with 10 populations in the National Park Gesäuse. Using eight permanently marked rectangular plots, the number and growth stage of clusters of this plant was mapped in 2015. This census has been repeated in 2017. The changes in size, number of shoots and location within the monitoring plots will allow conclusions regarding recruitment and mortality. These investigations will provide insight in the population dynamics and if necessary help to decide on the appropriate management measures to preserve this beautiful species.

Keywords

Gesäuse, narrow endemic, pink carnation, monitoring, population dynamics, habitat instability

Introduction

After extensive search for unknown populations and investigation of the extent of already known populations of *Dianthus plumarius* subsp. *blandus* (in short: *Dianthus blandus*) in the National Park Gesäuse in 2015, it was decided to establish monitoring areas to gain insight into *Dianthus blandus*' population dynamics (KÖPPL & OBERKLAMMER 2015). How endangered is *Dianthus blandus,* mainly settling in instable and often steep gravel slopes alongside ephemeral creeks and streams?

Due to enhanced precipitation and snow melting strong sediment movement occurs regularly ('wild water, steep rock' is not without cause the Gesäuse's slogan) and makes the habitat changes of *Dianthus blandus* unpredictable.

Thus, it was decided to set up monitoring areas at various locations with different likelihoods of being vanished, buried under gravel or staying stable. The monitoring is focused on providing information on rejuvenation trends, recruitment and mortality of Dianthus blandus in the National Park Gesäuse.

Methods

In summer 2015 eight rectangles were chosen due to criteria such as sufficient presence of *Dianthus blandus*, ageing structure and diversity in stability. 8 plots were finally set up in 7 different populations, using four steel bars for marking the corners of each plot. Each corner's distance to at least two distinct landmarks (trees, heavy rocks) was measured and documented. All plots have a width of 2 meters and a length ranging from 4 to 20 meters.

Within each plot all individuals of *Dianthus blandus* were mapped using a simple coordinate system, including information such as diameter, number of shoots (for small individuals), number of blossoms and other interesting observations (signs of browsing, infested buds, etc.).

All data were transferred to Excel tables and used to create plots showing the distribution and size of individuals within each monitoring area as an easy-to-read graphic. Furthermore, the obtained data was used to calculate ageing structure and blossoming rate according to growth stage of each monitoring plot. To simplify repeating the census sketches highlighting all necessary information on the surroundings were drawn and a detailed 'how-to' guide was created. The further responsibility for the execution of the monitoring was not settled at the time of the first report in autumn 2015.

In summer 2017, it was independently decided by the authors to repeat the census out of sheer interest in the development of *Dianthus blandus* and changes within the monitoring areas. All plots were visited and the census repeated, facing the first difficulties, such as loss of markings and parts of monitoring areas. The monitoring activities were executed regardless of shifting of corners. It was decided that most likely the monitored area itself will also have moved with the steel bars, if a rectangle remains visible and measurable.

Results

Plot stability

As briefly described, first difficulties occurred after two years, such as:

- Ground break-off
- Moved sediment
- Vanished corner markings

The lower populated half of one monitoring area (Langgries, situated directly at a steep break-off) had vanished, leaving 20 small individuals of *Dianthus blandus* in the upper section instead of 55 in 2015.

One other, seemingly stable monitoring plot (Höll) on a creek shoulder already stabilized by *Salix eleagnos* was totally buried in gravel, only leaving one individual above ground, where 86 individuals had been recorded 2015. Furthermore, one corner steel bar was lying upstream, one was gone altogether, while the other two had remained in the ground but had moved downstream. The original position of the plot could be reconstructed from photos and measurements and the remaining individual of *Dianthus blandus* was mapped accordingly.

Other monitoring plots have shown signs of immigration due to ground slipping (Gseng Alte Straße), but proven to be semi-stable to stable so far.

Census repeatment and subjectivity

Dianthus blandus grows according to its habitat either in a circular, pillowy form or grassy, using offshoots. (Fig. 1, Fig. 2) Thus, it is difficult to distinguish an amount of single, small individuals from mere offshoots. While in the first census it was tried to distinguish every possible individual in the grassy vegetation form, it was decided to combine probable offshoots to one bigger individual. This showed to have minimal influence on the graphic representation regarding total inhabited area but higher influence on the ageing structure as several small individuals from 2015 are now represented as one in a higher growth stage.

Still, this approach will be followed from now on because it does not change the inhabited area per plot, is easier to carry out and seedlings can easily be distinguished anyway.

Figure 1: Pillowy habit of *Dianthus blandus* – easy distinction of individuals

Figure 2: Grassy habit of Dianthus blandus – difficult distinction of individuals

Ageing structure

The main target of the monitoring is to find out if *Dianthus blandus* is endangered. Observing how individuals are developing over the years will allow to calculate extinction and growth stage transition probabilities. Results of 2017 show mainly a decrease of seedlings and small plants up to 1cm in diameter, with a loss ranging from 100% to 52% in 6 plots and an increase in two plots (200% and 16%).

Discussion

Time

The main obstacle in drawing conclusions regarding the development of *Dianthus blandus* is the short time the project has been in process. In 2015 the method was created and has since been slightly modified. Only the generation development along a timeline of several years will allow conclusions regarding transition probabilities between growth stages, providing insight into possible extinction probabilities at certain growth stages. Regression incidents may also be of interest.

Plot instability

There are different options on how it should be dealt with moved or 'vanished' plots. We decided to keep track of the moved sediment in order to keep monitoring the same individuals of *Dianthus blandus* over the years. This will also lead to width and length instability but we plan to reset the corner markings according to the already known plants. In the case of Höll, where the marked corner steel bars have (been) moved down- and upstream we will rethink the marking altogether. For 2017 a tree that has been part of the plot in 2015 was used to temporarily measure the position of the last present individual of *Dianthus blandus*. It will be decided 2018 if more stable means of marking the corners in this specific area should be used.

Another issue that might occur could be the total vanishing of *Dianthus blandus* in one plot, as it almost happened in Höll. It was decided to keep on monitoring because there could be a re-establishment form below ground or immigration - which would be interesting to watch.

Conclusion

The first repeat of the monitoring in 2017 has proven the instability of *Dianthus plumarius* subsp. *blandus*' favourite habitats and enabled further improvement of methods. It is necessary to pursue the annual monitoring activity to gain more information to be able to predict *Dianthus blandus*' development in the National Park Gesäuse. How to deal with the difficulty of monitoring individuals over the years in such instable terrain is another question to be solved (again) within the next census repeat.
The authors are very much looking forward to revisit all monitoring areas each year to 'keep in touch' with the ongoing changes in habitat structure and population development. As a cautious hint, we assume that the transition probabilities of seedlings and small plants to major growth stages are relatively small due to the outcome of this years' monitoring.

References

KÖPPL, W., OBERKLAMMER, I. 2015. Monitoring der Zierlichen Federnelke *Dianthus plumarius* subsp. *blandus* im Nationalpark Gesäuse, Arbeitsbericht. Nationalpark Gesäuse GmbH. Weng im Gesäuse.

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