Conference Volume | 5th Symposium for Research in Protected Areas 10 to 12 June 2013, Mittersill | pages 693 - 696

Vegetation Monitoring of Open Habitats in the National Park Thayatal – Results of the First Period

Ingrid Schmitzberger & Barbara Thurner

Abstract

Open sites, such as meadows and dry grassland, account for a large portion of the plant biodiversity in NP Thayatal. A monitoring system consisting of 53 permanent plots distributed over the range of vegetation types and management issues was re-surveyed after 7 resp. 8 years in 2010 / 2012.

The vegetation monitoring system was capable of observing vegetation development and dynamics on a fine scale. Most sites showed considerable changes in vegetation composition and species abundance – more on managed sites. Wild boar disturbance showed no long-term effects. Management activities by the National Park, such as periodic mowing of semi-dry grasslands or holding back shrubs proved successful.

In some hay meadows insufficient mowing frequency led to fallow effects. Mowing was more efficient in reducing fallow indicators than grazing.

Some of the changes observed must be attributed to differences in weather conditions between the compared years. More frequent sampling of at least a part of the plots would be necessary to account for this effect.

Keywords

Vegetation monitoring, dry grasslands, meadows, National Park Thayatal, permanent plot, periodic mowing

Introduction

Although the National Park Thayatal is dominated by forest, a large portion of its biodiversity – especially plant diversity - is connected to its open habitats. Among those are meadows and fallow meadows on alluvial terraces in the valley bottom as well as dry grasslands on exposed and shallow sites higher up on the canyon slopes. Some are subject to management activities by the National Park authorities.

In 2003 a monitoring system was established for the vegetation of forest free sites (SCHMITZBERGER & WRBKA 2005). It aims at observing vegetation development both induced by management activities as well as spontaneous processes. It includes 53 permanent plots to monitor vegetation changes on a very fine scale. From 2010 to 2012 they were re-sampled for the first time.

Methods

The core element of the monitoring system is a set of 53 permanent plots of 4 m², each subdivided into 4 subplots of 1m². In each subplot, all vascular plants are listed and their cover estimated each on a percentage scale. The monitoring system also includes a vegetation-complex monitoring to address the changes of vegetation types on the landscape level.

30 plots are on alluvial meadows, 23 on xeric grasslands. They are distriubuted over the whole range of site conditions and attempt to cover all major vegetation types. Some plots represent a management issue in additon, such as mowing vs. grazing, trampling, disturbance.

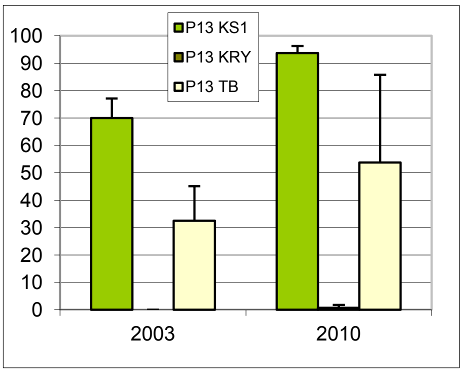

Figure 1: vegetation cover (%) in P13 in 2003 and 2010. KS1...herb layer, KRY...cryptogam layer, TB...old biomass

For analysis the species were attributed to ecological groups, such as the csr-strategy types after Grime (GRIME 1974, 1979) following the BIOLFLOR database (KLOTZ & KÜHN 2002, KLOTZ et al. 2002). Changes in the spectra of these ecological groups were analysed.

Results

Example 1 Disturbance in dry Bromus-meadow

The alluvial meadows are subject to episodic disturbance by wild boars that dig in the soil in search for worms and roots. Plot 13 at the site "Untere Bärenmühle" is an example of a species-rich dry Bromus meadow with moderate scuffing in 2003. In 2010 no signs of disturbance remain: herb cover changed from 70 percent to over 90% (Fig. 1), quite typical for meadow vegetation. Species number rose from 48 to 54. The strategy type spectrum reveals the main increase in stress-tolerant competitors (cs-type), represented by grass species typical for dry meadows, such as *Bromus erectus, Festuca rupicola* and *Elymus hispidus*. Ruderals (r) and stress-tolerant ruderals (sr) previously existing due to the disturbance vanished completely (Fig. 2).

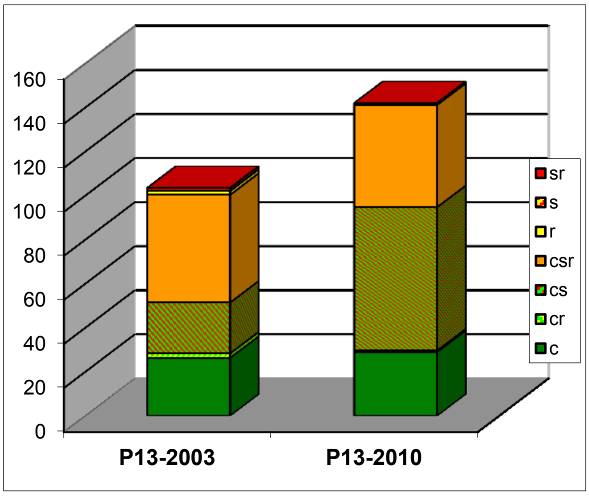

Fig. 2: percentage cover (cumulative) of Grime's strategy types in meadow-plot 13. c… competitors, r… ruderals, s… stress-tolerants, and intermediate types.

Example 2 Periodic mowing management in semi-natural dry Bromus-grassland

Semi-natural Bromus grassland at the site "Hardl" in 2004 showed signs of fallow succession that may lead to a reduction in dry grassland species over the years. Periodic mowing management meanwhile took place two times: in 2008 and 2011.

The main fallow-indicator, *Brachypodium pinnatum*, was substantially reduced from about 25% cover to 1,4%. Winner was the sedge *Carex humilis* (5 to 16%), whereas *Bromus erectus* also showed a small reduction (from 19 to 16% cover). The strategy type spectrum moved from stress-tolerant competitors (cs) to intermediate csr-type (Fig. 3), mainly due to the changes between these grass species, as *Carex humilis* belongs to the csr-type.

The two occurring *Inula*-species - rather dynamic –switched in their significance for the vegetation stand: *Inula oculus-christi* largely increased (0,25 to 8,5%) while *Inula hirta* decreased from 10 to 1%.

Periodic mowing greatly changed this vegetation and can be attributed as successful.

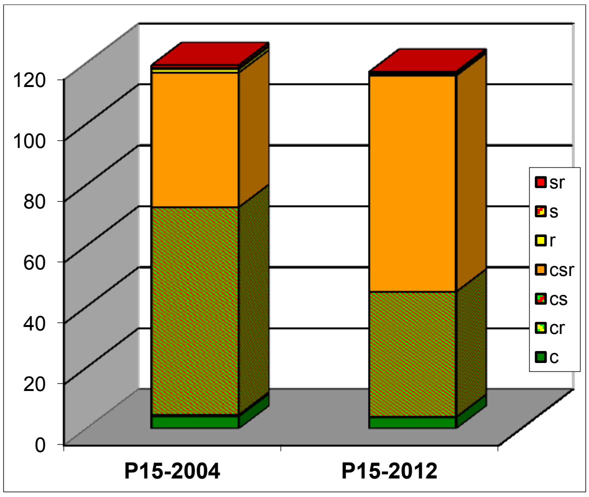

Fig. 3: percentage cover (cumulative) of Grime's strategy types in dry grassland-plot 15. c… competitors, r… ruderals, s… stress-tolerants, and intermediate types. Stress-tolerant competitors (cs) decreased while the intermediate csr-type increased.

Example 3 Blue grass steppe – Trampling

The blue grass steppe proved to be the most stable vegetation type of all. In this example we show a rather small spot above a rock face that attracts visitors by nice views although the path is closed. As can be seen in the foto-documentation the pattern of plant cover, especially that of the tufts of the blue grass *Sesleria varia*, remained quite constant. Much the same was the distribution of strategy types, and changes in single species remained marginal with the largest increase amounting to about 4% with *Potentilla pusilla*.

As in many other dry grassland plots, we lost some species between 2004 and 2012. Most of them were tiny representatives of (partly) ruderal strategy types (r, sr, cr). The extremely dry spring in 2012 prevented them from emerging. As we saw the reduction of therophytes in almost all 2012-plots, we attribute it to a weather effect rather than a sign of reduced disturbance.

The spatial stability of the plants suggests a constant or slightly reduced trampling impact - a positive report assuming increased visitor numbers along the paths in the National Park. This extraordinary constant vegetation type would be especially vulnerable to increased disturbance due to its low recovery rate

Discussion

The development in the 53 vegetation plots is quite different, much according to the different vegetation types and management issues. Most sites showed considerable changes in vegetation composition and species abundance. Only one vegetation type surprised by extraordinary stability up to the individual plant.

Altogether we saw large variations between the compared years presumably caused by disparate weather conditions: Meadows were sampled 2003 and 2010, 2003 being a slightly dry season whereas 2010 was the last of 7 rather wet years. Especially the winter was rich in long-lasting snow (ZAMG) which led to extraordinary good water supply in spring. Therefore the meadow vegetation was much lusher in 2010. Often we found increases in species richness. Many meadows showed significant turnovers in species abundance. Difficulties arise as to which degree the differences observed must be attributed to this weather effect.

For the dry sites-survey the effect is opposite, with a wet spring in 2004 that led to lush vegetation and the occurrence of many short-lived species that are missing in other years. In contrast, 2012 was the second extremely dry season in series. 90% of the plots on dry sites lost species, the vast majority of those being short-lived ruderals. We attribute this loss mainly to the weather effect.

The hay meadows are mown by local farmers according to management prescriptions. In some parts, problems with insufficient mowing frequency lead to fallow effects with increasing abundance of fallow indicating grasses, mostly *Brachypodium pinnatum* or *Calamagrostis epigeios*. Where such effects had already been evident before 2003, they were reduced, e.g. on the "Obere Bärenmühle".

A special case is the "Große Umlaufwiese" that lay fallow for 10 years before the setup of the National Park. It was strongly overgrown mostly by *Calamagrostis epigeios*. In 2001 management was resumed partly by sheep-grazing, partly by mowing. Two plot-pairs compared these two treatments. Mowing proved to be more efficient in reducing *Calamagrostis epigeios* and restoring a species rich, nutrient poor meadow vegetation.

Wild boar scuffing is frequently observed both in meadows and on the dry sites. Short time effects are reduced vegetation cover and an increase in ruderal species. In meadows, its effect could no longer be detected seven years later. Only if the portion dug up every year exceeds a certain limit, wild boar scuffing becomes a management problem in meadows.

On the dry sites, the disturbed plots of 2004 were again disturbed in 2012, indicating a higher disturbance frequency there. In dry acid open grassland the effect was only slight, increasing openness and adding short-lived ruderals (that partly lacked in dry 2012).

Conclusion

Our vegetation monitoring system is capable of observing vegetation development and dynamics on a fine scale.

Management activities by the National Park, such as periodic mowing of semi-dry grasslands or holding back shrubs proved successful. Problems only arose in some parts where management actions have not (yet) been taken.

In hay meadows, management success differs very much between sites. Partly problems with insufficient mowing frequency and subsequent fallow effects persist. Mowing proved more efficient in reducing fallow indicator-grasses than grazing.

More frequent sampling of at least a part of the plots would be necessary to address the weather effect and better understand real trends in contrast to yearly oscillations.

References

GRIME, J. P. 1974. Vegetation classification by reference to strategies. – Nature 250: S. 26-31

GRIME, J. P. 1979. Plant strategies and vegetation processes. – Chichester (Wiley) 222 S.

KLOTZ, S. & I. KÜHN 2002. Ökologische Strategietypen. Schriftenreihe für Vegetationskunde 38:197-201.

KLOTZ, S., KÜHN, I. & W. DURKA [Hrsg.] 2002. BIOLFLOR - Eine Datenbank zu biologisch-ökologischen Merkmalen der Gefäßpflanzen in Deutschland. - Schriftenreihe für Vegetationskunde 38. Bonn: Bundesamt für Naturschutz.

SCHMITZBERGER, I. & T. WRBKA 2005. Vegetationsökologisches Monitoring von waldfreien Habitaten im Nationalpark Thayatal. Studie im Auftrag der Nationalparkverwaltung Thayatal.

ZAMG (Zentralanstalt für Meteoralogie und Geodynamik), available at: http://www.zamg.ac.at/cms/de/klima/klima-aktuell/jahresrueckblick (accessed on

Contact

Ingrid Schmitzberger
ingrid.schmitzberger@coopnatura.at

Barbara Thurner

coopNATURA
TB für Biologie
Kremstalstraße 77
3500 Krems
Austria