Dry grasslands
– species interactions and distribution –

Conference proceedings

- Edited by Monika PARTZSCH & Ute JANDT -

HALLE (SAALE), GERMANY

31st of August till **2rd of September 2009**

6th Meeting of the European Dry Grassland Working Group (EDGG)

MARTIN-LUTHER-UNIVERSITÄT HALLE-WITTENBERG
Institut für Biologie/Geobotanik und Botanischer Garten

Floristisch-Soziologische Arbeitsgemeinschaft e.V.

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PROGRAM

Monday, 31th of August 2009

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14:15 – 14:25	Welcome address of the speakers of the European Dry Grassland Working Group (EDGG) Jürgen DENGLER and Ute JANDT
14:25 – 14:45	C. HOBOHM & I. BRUCHMANN (GERMANY): Endemic vascular plants in European grasslands
14:45 – 15:05	C. WELLSTEIN [1] & P. KUSS (GERMANY/SWITZERLAND): Functional response traits to climatic gradients in alpine dry grassland ecosystems
15:05 – 15:25 spatial	S. HANOTEAUX, M. SEIFAN & K. TIELBÖRGER (GERMANY): Effects of patterns on a less attractive species success – a simple modelling approach
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9:35 – 9:55	O. PURSCHKE, M. T. SYKES, P. POSCHLOD & H. C. PRENTICE (GERMANY/ SWEDEN): How is the dispersal potential of semi-natural grassland plant communities related to landscape history?
9:55 – 10.15 hills,	A. JONES (BELGIUM): Dry Grassland species of Transylvanian slumping distribution and ecology-post glacial refugia and ecological dustbins

10:15 – 10:35	T. KAZANTSEVA, N. BOBROVSKAYA & R. NIKULINA (RUSSIA): The hundred-year dynamics of vegetation of meadow-steppe fallow land of 1908 (Russia, Voronezh region, "Kamennaya step" reservation)
10:35 – 10:55	G. S. MALYSHEVA & P. D. MALAKHOVSKY (RUSSSIA): The east-European steppes of privolzhskaja hills (subvolga hills)
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11:15 – 11:35	C. STORM & C. FAUST (GERMANY): Effects of nutrient addition in sand pioneer grassland – a 8 years study
11:35 – 11:55	G. HORNEMANN & W. DURKA (GERMANY): Genetic variation, population size and plant fitness in isolated populations of the endangered *Muscari tenuiflorum* (Hyacinthaceae)
11:55 – 12:15	V. WAGNER, I. HENSEN & W. DURKA (GERMANY): Genetic structure and performance in peripheral and core populations of the steppe grass *Stipa capillata*
12:15 – 12:35	J. TREIBER, I. HENSEN & K. WESCHE (GERMANY): *Stipa pennata* - high genetic diversity among isolated populations of a rare steppe grass in Germany
12:35 – 12:55	H. VON WEHRDEN, J. HANSPACH, J. TREIBER, H. ZIMMERMANN[1], K. RONNENBERG & K. WESCHE (GERMANY): Dry meadows in the Gobi Altay: Communities, gradients, biogeography and trait patterns
12:55 – 14:00	*Lunch break*
14:00 – 15:00	Matthias HOFFMANN (Halle): Guided walk through the Botanical Garden of our Institute
15:00 – 15:20	J. BAMMERT (GERMANY): Zur unterschiedlichen Verbreitung xero-thermophytischer Arten in SW-Mitteleuropa
15:20 – 15:40	M. JESCHKE (GERMANY): Interactions and specific reactions of cryptogams and vascular plants to restoration measures in calcareous grasslands
15:40 – 16:00	M. PARTZSCH (Halle): The porphyry landscape near Halle (Saxony-Anhalt, Germany) – an example of fragmented landscape

(Introduction to the 1st excursion)

16:00 – 16:20 M. PARTZSCH (Halle): Populations of *Dictamnus albus* L. (Burning Bush) in thermophile fringes of the lower Unstrut-valley (Saxony-Anhalt) (Introduction to the 2nd excursion)

16:20 – 16:30 M. JANISOVA (SLOVAK REPUBLIC): Invitation for the 7th dry grasslands meeting in Smolenice 2010"

16:20 – 16-40 *Tea time*

16:40 – 17:40 Poster session

18:00 – 18:45 Final discussion

19:00 "Get together" at the greenhouse of the Botanical Garden

Wednesday, 2nd of September 2009

9:00 – 17:00 Excursion to the porphyry landscape near Halle (Saale)

Thursday, 3rd of September 2009

9:00 – 17: 00 Excursion to dry grasslands near Freyburg (Unstrut) with populations of *Dictamnus albus* (burning bush)

ORAL CONTRIBUTIONS

Zur unterschiedlichen Verbreitung xero-thermophytischer Arten in SW-Mitteleuropa

Joachim-Wolfgang BAMMERT

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An einer Reihe ausgewählter Spezies aus der Artengarnitur von Trockenrasen, Felsfluren, thermophilen Säumen und Trockenwäldern werden verschiedene Verbreitungsmuster innerhalb eines geographischen Gebiets, das von Schwäbischer Alb und Bodensee über den Oberrhein bis Burgund reicht, aufgezeigt und kommentiert. Die Arten werden dabei nach chorologischen Gesichtspunkten in Gruppen angeordnet. Dies gibt einen Eindruck von der Vielfalt kleinräumiger Unterschiede bei den Pflanzengesellschaften der genannten Formationen in diesem Gebiet. Ferner zeigt sich die Komplexität der Frage nach den Gründen für diese Unterschiede. Oft stehen mehrere Hypothesen gegeneinander, ohne dass eine Entscheidung möglich wäre.

The basiphilous dry and semi-dry grasslands (*Festuco-Brometea*) in N and NE Europe: from a vegetation database to a consistent large-scale classification

Jürgen DENGLER[1], Steffen BOCH[2], Swantje LÖBEL[3], Pawel PAWLIKOWSKI[4], Solvita RŪSIŅA[5] & Wojciech STACHNOWIC[6]

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The aim of our study was to develop a comprehensive and consistent classification of the basiphilous dry and semi-dry grasslands (*Festuco-Brometea*) in the Nordic (Scandinavian) and circum-Baltic regions. This area includes ten countries or parts of them, namely Norway, Sweden, Finland, Russia, Estonia, Latvia, Lithuania, Poland, Germany, and Denmark. Further, we aim to unravel gradients in species composition and species richness across the studied regions and reveal the role of relevant ecological factors structuring the complexity of the *Festuco-Brometea*.

For the purpose of this study, we made use of the phytosociological database of the "Working Group on Dry Grasslands in the Nordic and Baltic Region", which is a joint project of colleagues from all ten listed countries. Ultimately, our aim is to include in the database all available relevés (both published and unpublished) of the dry grasslands and related vegetation types from the study area. As prerequisites for inclusion of the plots into the database we consider the size of the relevés not to lie outside 1 m² and 100 m² and presence of basic metainformation on the locality of a relevé. Presently, the database contains some 8,000 of the ca. 20,000 suitable relevés we are aware of. For the present study, we attempted to enter at least all relevés showing obvious similarities to the *Festuco-Brometea*.

The first decisive step in any classification is to delimit the syntaxon in focus unambiguously throughout the studied data set. It is evident that this delimitation can neither be based on the original assignment of the relevés nor on an a priori classification of all vegetation types of that area (as such a system is not available). Thus, we used generally accepted diagnostic taxa of relevant classes and assigned each relevé to the one class whose diagnostic species prevailed. The obtained sub-set of the *Festuco-Brometea* contained approx. 2,700 relevés. Only those 1,041 relevés with plot sizes between 4 m² and 25 m² and with cryptogam treatment were used.

The TWINSPAN analysis resulted in a very clear floristic bipartition between stands in Poland and Germany on the one hand and those of all other regions (including coastal parts of Germany) on the other. After a moderate manual refinement, the classification resulted in the assignment to two orders, three alliances, and five associations:

Festucetalia valesiacae - xerophilous, steppic grasslands
Festucion valesiacae
Potentillo arenariae-Stipetum capillatae

Brachypodietalia pinnati - meso-xerophilous basiphytic grasslands
Cirsio-Brachypodion pinnati - subcontinental Europe
Adonido vernalis-Brachypodietum vernalis

Filipendulo-Helictotrichion pratensis - Nordic-Baltic region
Alchemillo glaucescentis-Festucetum
Fragario viridis-Helictotrichetum pratensis
Veronico spicatae-Avenetum pratensis

Effects of spatial patterns on a less attractive species success – a simple modelling approach

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Plant communities are shaped by several mechanisms, including environmental conditions, direct interactions between species and indirect interactions with other groups, such as pollinators and herbivores. While facilitation has already been recognized as a significant factor shaping direct interactions, the role of indirect positive effects remained poorly understood. Though several studies brought evidence to the existence of indirect facilitation in a wide range of ecosystems, we are still lacking a general understanding of the principal features of the plants and the facilitative vectors which enable it. Here, we present a spatial explicit model (cellular automaton for the plant individuals coupled with an Agent Based Model for the pollinators) used in order to identify the theoretical conditions leading to coexistence of an attractive and a less attractive species in a virtual community of grassland annuals. Assuming generalist pollinators, non-attractive individuals will benefit from the vicinity of attractive neighbours due to an increase in the visitation rate in their close neighbourhood. On the other hand, high density of attractive neighbours may deter pollinators from visiting the non-attractive individuals. Therefore, we

predict that the spatial distribution of the two species will affect the potential indirect facilitative effect, and hence the ability of the species to coexist. To test that, we modelled attractiveness of a plant species as a static parameter and generalist pollinator behaviour as changing over time depending on the rewarding character of his last visit, keeping a certain inborn preference of the pollinator toward the attractive species. Further development of the project will include combination of the model with existing theoretical models concerning direct interactions, as well as garden and field experiments in grasslands of the Swabian Alb (Germany).

Endemic vascular plants in European grasslands

Carsten HOBOHM & Ines BRUCHMANN

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Our study area comprises the biogeographical Europe as defined in FONTAINE et al. (2007).

We hypothesize that ecological stability in time combined with large species pools give the most positive impacts on the diversity of endemic taxa within a region in general. This means that habitat types differing in space and stability time should harbour different amounts of endemics.

We evaluated many European floras and floristic monographs on distinctive regions of Europe for data on the distribution of endemic species and - so far available - habitat specific data such as habitat ecology, plant communities, elevation above sea level, and others.

As far as possible we assigned endemic taxa to predefined habitat categories. In consideration of several difficulties and biases reasoned by differing habitat terminology in different European languages or by differing international regulations and standards of classification we defined eight habitat categories. These correspond quite well with those defined by the Habitat Directive of the European Commission (European Commission DG Environment, 2007). We distinguish rocky habitats and screes, (non-woody) grassland ecosystems, scrubs and heaths, forests (including tree plantations), coastal and saline habitats, arable lands and other man-made habitats, inland water bodies (standing and running waters), and mires (including bogs, fens, swamps).

At the moment the database comprises 6200 subspecies, species or species groups of vascular plants that are known to be endemic to Europe. This is the minimum number because the list is still growing. We estimate that the whole number will increase to 6500 taxa or 20-30 % of the whole flora (excluding apomictic microspecies). It was possible to assign 4669 taxa to one or more of the predefined habitat categories.

Rocky habitats and screes inhabit the lion´s share of European endemic vascular plant taxa with about 38,6 %, followed by grassland ecosystems (18,1 %), shrub and heath habitats (15,5 %), forests (10,7 %). Coastal and saline habitats (6.3 %), arable lands and other man-made habitats (5.8 %), standing and running waters (3.6 %), and finally mires which inhabit only about 1.4 % of the European endemic taxa have smaller rates.

Europe is in charge to protect those taxa that are restricted to its boundaries. The analysis within the database of European endemic vascular plant taxa affirms the importance of both cultural and

natural landscapes in an equal measure. In particular we would like to encourage stakeholders of nature conservation to turn more attention to grassland ecosystems which harbour the second largest number of European endemic vascular plant taxa. In contrast to many other habitat types grassland ecosystems are strongly endangered or destroyed resulting in a creeping loss in quantity and quality.

Genetic variation, population size and plant fitness in isolated populations of the endangered *Muscari tenuiflorum* (Hyacinthaceae)

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Gene flow may be restricted between spatially isolated plant populations and especially in small populations alleles are lost due to genetic drift and increased probability of inbreeding. This can lead to increased population differentiation and to reduced individual plant fitness and population viability. We analysed genetic variation within and among 34 isolated populations of the endangered *Muscari tenuiflorum* in Central Germany using amplified fragment length polymorphism (AFLP) and allozymes and estimated population size and reproductive fitness. The species is restricted to xerothermic dry grasslands, often on isolated porphyry outcrops. Genetic diversity within populations was high (AFLP: mean He = 0.249; allozymes: mean He = 0.346) and typical for long lived outcrossing species. Populations were moderately differentiated (AFLP: overall Fst = 0.241; allozymes: overall Fst = 0.214). An analysis of molecular variance (AMOVA) revealed high variation among populations (AFLP: 26 %; allozyme: 17 %). Population differentiation was independent of geographic distance below 20 km, but increased at larger distances. Genetic diversity was higher in large populations and also reproductive fitness, measured as the number of seeds per capsule, slightly increased with population size. Genetic variation was not correlated with reproductive fitness. Both molecular methods revealed similar patterns of genetic variance within and among populations. The results clearly demonstrate that population size, genetic variation and plant fitness are closely connected. Genetic drift as the main process shaping population structure in *Muscari tenuiflorum* reduced both genetic variation and plant fitness in small populations and thus can affect long term population viability.

Interactions and specific reactions of cryptogams and vascular plants to restoration measures in calcareous grasslands

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Vascular plants, bryophytes and lichens are the most important plant groups in calcareous grasslands in terms of species numbers, phytomass and cover. In many restoration projects only vascular plants are used as indicators, whereas cryptogams are rarely used to evaluate restoration success.

The responses of different plant groups to restoration measures and the resulting interactions between the plant groups were investigated in several grasslands in southern Germany and Switzerland.

Xerophytic cryptogam communities, consisting mainly of acrocarpous mosses and epigaeic lichens, can be successfully transferred by raked cryptogam material from species-rich sites. The results show high survival rates of xerophytic species on plots with previously removed topsoil five years after transfer, whereas survival rates on plots with intact, nutrient-rich topsoil were significantly lower. On sites without soil removal vascular plants reached very high cover rates, suppressing xerophytic cryptogam growth.

The colonization distances from receptor plots on topsoil removal sites differed between cryptogam species and were significantly influenced by main wind direction.

Xerophytic acrocarpous mosses were shown to regenerate slower than xerophytic pleurocarpous mosses. Pleurocarpous mosses are often brought to restoration sites by the transfer of diaspore-containing hay from nearby nature reserves. By forming large clones they can cover topsoil removal sites in less than ten years, thereby inhibiting the colonization by acrocarpous mosses and epigaeic lichens. The transfer of raked material with a high amount of xerophytic acrocarpous mosses allows these to compete with the pleurocarpous mosses during the colonization of new sites.

Dry Grassland species of Transylvanian slumping hills, distribution and ecology-post glacial refugia and ecological dustbins

Andrew JONES

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Fundatia Adept has been surveying and cataloguing the species, fine and coarse scale habitats of curious geomorphological features in Transylvania, the slumping hills. These botanical hotspots are situated in a species diverse, traditionally farmed pastoral, arable and forested semi-lowland landscape. Dryland species such as *Daphne cneorum, Crambe tartarica* and *Iris aphylla* hungarica and endemics such as *Cephalaria transilvanica* rub shoulders with mountain plants including *Anemone sylvestris, Lilium martagon* and *Sesleria heufleriana*. With rapid changes to farming and even the threat of removal of hills for use as aggregates in building, these precious sites need special care and consideration. To secure their future, an understanding of their value at a genetic, species and habitat level and management requirements is essential.

The hundred-year dynamics of vegetation of meadow-steppe fallow land of 1908 (Russia, Voronezh region, "Kamennaya step" reservation)

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The study was held in Middle-Russia forest-steppe of Central Chernozem region. The fallow land has been under absolute protection since 1912. The investigation of this fallow land allowed us to monitor 4 stages of successions and durations of them. The first stage was characterized by restoration of meadow-steppe vegetation. The rootstock grass *Elytrigia repens* is a dominant. A grate part belongs to weeds, such as *Cirsium arvense, Verbascum orientale* and others. Two species of trees and three shrubs were recorded, but abundance of them was small. Duration of this stage was 19 years. On second stage grass aggregations (such as *Bromopsis riparia, Festuca valesiaca, Calamagrostis epigeios*) displaced herbs. There are 5 species of trees and 9 species of shrubs in these communities. A grate part of them belongs to steppe shrub *Amygdalus nana* (18%). Duration of this stage was 20 years. On third stage vegetation consisted of trees and shrubs thickets several grass communities. New species of trees and shrubs have appeared. It was recorded 21 species. Species *Acer tataricum*, *Rhamnus cathartica* and *Crataegus curvisepele* predominate in these communities. Mosaic structure of vegetation cover has increased. Duration of this stage was 25 years. On fours stage the whole fallow land was overgrown with trees and shrubs. It was recorded 15 species, 75% of them were trees. The dominant is *Acer tataricum*, co-dominant is *Acer negundo*. Shrubs *Crataegus curvisepala, Sambucus racemosa* was good developed. Density of crown of tree
layer was 1.0. Participation of perennial and annual herbs was only 3%. Duration of this stage was more than 30 years. Maple forest in regime of absolute protection has been formed. Climatic fluctuation was studied at the same time.

The east-European steppes of privolzhskaja hills (subvolga hills)

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The East-European steppes located in central part of Privolzhskaja Hills have a good conservation. The complex relief of this area, such as watershed massifs, peat banks (240-360 m. above s. l.) and undulating plants between them creates the diversity of plant cover. There are not glacial deposits on the Hills Paleogen, neogen-quaternery and cretaceous deposits have appeared above ground.. Ordinary, south and carbonate chernozems soils are the main here. Watershed massifs are covered by forests of *Quercus robur*, Slopes and plans are covered by different types of steppes. Meadow-steppes are presented by narrow stripes (100-200 m, 300-400 m wide) on the board of the forest in the high part of slopes. The role of *Stipa pennata* and *Stipa capillata* is very important here. The species number is 60-80 in these phytocoenosis. Rhizome grasses as *Bromopsis riparia, Poa angustifolia* and species of meadow-steppe herbs as *Filipendula vulgaris, Fragaria viridis*, *Anemone sylvestris, Linum perenne, Adonis vernalis* and others predominate here. The meadow-steppes are represented by different associations. Mixtoherboso-Salvio nemorosae-Stipeto pennatae-Stipetum capillatae, Mixtoherboso-Genisto tinctoriae- Stipeto pennata-Stipetum capillatae are the most typical of them. True steppes are represented by communities with predomination of *Stipa capillata* and *Festuca valesiaca*. The composition of steppe herbs is not so riche (27-35 species in community). Petrophytic variants of steppes with *Hedysarum grandiflorum, Thymus cimicinus, Achillea nobilis, Onosma simplicissimus, Pimpinella tragium* and others predominated on cobble skeleton slopes. Mixtoherboso-Festuca valesiacae-Stipetum capillatae, Mixtoherboso-Euphorbio virgatae-Stipetum capillatae,

Mixtoherboso-Salvio nutansea-Stipetum capillatae and others associations are most typical of true steppes. Firm-banch grasses dry steppes are characterize by some floristic individuality. They are representing by small fragments on the east slope to Volga on south chernozems. *Stipa lessingiana, Festuca valesiaca* predominate there. The role of *Galatella vilosa, Ephedra dystachia, Kochia prostrata, Artemisia lerchiana* increase on this territory. It is the most northern invasion of *Stipa lessingiana* communities on the right bank of Volga. The main association of these communities is Festuco valesiacae-Stipeto lessingianae.

This is a main floristic and fhitocoenotic feature of East-European steppes of Privolzhskaja Hills. There are many relicts and endemics (*Mattiola fragrans, Hyssopus creteceae, Crambe litwinovii, Globularia punctata, Asperula exaperata, Alyssum lenense*, *Dianthus volgicus, Gypsophilla wolgensis*) and others on Pryvolzskaja Hills. There are a composition of zonal and altitude types of plants with predomination of petrophytic variants on this area.

How is the dispersal potential of semi-natural grassland plant communities related to landscape history?

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Semi-natural grasslands show high levels of species richness. Ongoing habitat fragmentation and reduced dispersal processes which are related to land use complicate the arrival at suitable microsites for a number of species and thus are limiting species richness. Therefore, it is hypothesized that the composition and species richness in plant communities is related to changing dispersal processes in the past and reflects the connectivity of today's grassland habitats to dispersal sources in the past.

The aim of our study is to explore how dispersal potential of semi-natural grassland communities in the present landscape is linked to landscape history. Based upon this we try to explore the effectiveness of dispersal processes in today's landscape.

The study was carried out in dry semi-natural grasslands in a 4,5 x 4,5 km mosaic agricultural landscape on the Baltic Island of Öland (Sweden). Based on historical maps and aerial photographs from four different time periods between the year 1835 and today all present day semi-natural grasslands were classified into 113 polygons according to their age and previous land use. In each polygon Presence/Absence data of all semi-natural grassland indicator species was collected. Habitat connectivity and the structure of the matrix for the present and past landscape were calculated within a 300 m buffer around each sampled grassland polygon. A set of species specific traits related to dispersal in space and time were compiled from data bases and experiments; Epizoochory and wind dispersal potential but also seed production, seed mass and seed shape were obtained from standardized measurements according to the LEDA protocol. Moreover, indices for endozoochory and seed bank longevity have been calculated.

We performed Fourth-Corner analysis to explore the link between the dispersal traits of the species in the present community and the habitat connectivity of grassland patches where the species are found.

The significance of the correlations was assessed by permutation testing for all time periods.

We found a significant, positive correlation between grassland connectivity in the past landscape and epizoochory as well as wind dispersal potential. The heterogeneity of the landscape matrix in the past was negatively correlated to both epizoochory and wind dispersal potential, which indicates the importance of a large, open and well connected landscape in the past. Moreover, we detected that species with high epizoochory as well as good wind dispersal potential were overrepresented in the oldest grassland patches. Seed output per unit area was negatively correlated with connectivity to grasslands in the past. No clear correlation between landscape structure and endozoochory as well as seed bank persistence was found.

Our first results suggest that dispersability by wind is not effective in the present landscape. This study also stresses the importance of a long continuity of grassland management and lifestock grazing in the past to maintain species rich, semi-natural grassland communities.

Effects of nutrient addition in sand pioneer grassland – a 8 years study

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We examined pioneer stages of a dry, nutrient-poor, calcareous inland sand ecosystem for 8 years in the northern upper Rhine valley (Germany). Within a 5-fold replicated randomized block design, 10-m² plots were given 6 single or combined applications of nitrogen (= N), phosphorus (= P), potassium and other essential nutrients ten times a year. Data were analyzed by mixed linear models.

After four years, above-ground vascular plant species' productivity doubled after nitrogen addition. Additional nutrient elements did not increase productivity further, indicating nitrogen limitation. The cover of 10 species and the height of 15 (out of 19 examined) species were significantly enhanced by nutrient addition. *Corynephorus canescens* was the only species with significant height depression by nitrogen addition. Other habitat typical species such as *Saxifraga tridactylites* and *Silene conica* produced significantly more seed capsules after N input. This provides evidence for nutrient limitation of many individual species across all life forms. Mostly a phosphorus + nitrogen co-limitation is established.

Even though most species were initially facilitated by nutrient addition, it can be hypothesized that in the long run there will be competitive interactions resulting eventually in a decline of inferior species. Within the first four years this was not the case, and species diversity was not affected by nutrient addition. However, preliminary data inspection of the following years confirms the hypothesis. This result emphasizes the necessity of long-term studies.

Stipa pennata - high genetic diversity among isolated populations of a rare steppe grass in Germany

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Stipa pennata s. str. (= *St. joannis*, Poaceae) has its western distribution limit in Central and Western Europe, where it is a rare species restricted to some non-zonal sites. It was presumably widespread in post glacial times yet is today a typical relict species. Suchlike rare species occurring in small populations are typically expected to show low genetic diversity within and high heterogeneity among populations. Potential explanations are bottleneck incidences, long-term isolation effects and on-going fragmentation. These diversity patterns seem to be especially pronounced in selfing species.

Random amplified polymorphic DNA (RAPD) markers were used to characterize genetic heterogeneity within and among 16 populations of *St. pennata* in central and western Germany. Estimates of the percentage of polymorphic bands and Shannon's diversity were comparatively low within the populations and not related to population size. Φ-Statistics and analysis of molecular variance (AMOVA) indicated that most of the variability was partitioned among populations (62 %) and few within them (17 %). These findings were supported by results of a principal component analysis. Our results imply that *St. pennata* is indeed a relict species that experienced strong bottlenecks in Germany, and these effects were enhanced by isolation and selfing.

Dry meadows in the Gobi Altay: Communities, gradients, biogeography and trait patterns

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We performed a study in the Dund Saykhan mountain, which is one of the easternmost outposts of the Altay in the Gobi desert of southern Mongolia. 100 randomly placed vegetation checks were made in the 2 x 2 km peak region, where we sampled vegetation and some standard environmental parameters on 3x3 m plots. In a first step we compiled a phytosociological description of the plant communities, which amended existing studies. In a second step we modelled the distribution of all abundant species using binomial GLMs, which applied transformations of Landsat data and a digital elevation model as predictors. This procedure confirmed altitude as the single most important predictor; however were several significant

models based on Landsat transformations as well. Thus around half of the species 124could be predicted with reasonably accuracy (AUC threshold >0.7).
In a third step we compiled maps of each species' distribution range based on a wide literature survey. We thus present a biogeographical assessment of these relic stands, which allows us to infer the distribution context of the flora. We then analysed the micro sites of the peak region to relate the biogeographical spectrum with the different vegetation types. In a last step we compiled a trait matrix of the complete dataset based on the available literature; we then tested the traits against the environmental gradients; in addition we analysed the traits in the context of the different biogeographical groups and the abundant plant communities.

Genetic structure and performance in peripheral and core populations of the steppe grass *Stipa capillata*

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The abundant centre hypothesis predicts that species are most abundant in the core of their ranges where environmental settings are most suitable for them. As ecological conditions decline towards the range periphery, populations are believed to become more fragmented, and the individual performance and local density lower as compared to the centre. As a genetic consequence, edge populations are thought to be genetically less diverse and more strongly differentiated due to genetic depletion and lack of gene flow. We tested these predictions in populations of the steppe plant *Stipa capillata* L. (Poaceae) at the centre of its range, in the vast steppes of Kazakhstan, and at its periphery, in grassland fragments in Central Europe. We report on the comparisons of 1) local density, plant size and reproductive performance in field studies and experiments, as well as of 2) the genetic diversity and structure using AFLP markers.

Functional response traits to climatic gradients in alpine dry grassland ecosystems

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Investigating functional response traits of plant communities along climatic gradients will provide new hypotheses on the possible future changes in taxonomic and functional composition of communities. Here, we identified functional response traits of the main important alpine dry grassland communities to major ecological gradients (low vs. high elevations, mesic vs. dry soil conditions). Elevation was used as proxy for changes in temperature (warming), soil moisture was used as proxy for changes in precipitation (drought). Grassland communities were selected taking a stratified random sample from the dry grassland inventory of the Swiss Alps. To study the functional response of clonal growth, leaf, seed, and whole plant traits of these grasslands we

combined European databases (CLOPLA 3, Biolflor, LEDA) with additional own investigations on the species. Obtained results on clonal growth traits show that the five main clonal growth organs (CGOs) were significantly influenced by the altitudinal gradient (warming) and the soil moisture gradient (drought). Moreover, clonal diversity was strongly dependent on species richness and declined with altitude. Results on leaf, seed and whole plant traits will be presented. The differences in temperature and soil moisture along the ecological gradients are to some extent similar to the predicted climate change in the Swiss Alps. This implies that the empirical functional response traits may indicate the sensitivity of traits of alpine dry grassland communities to climate change.

POSTER:

Do habitat requirements, reproduction, and dispersal potential explain rarity of the relictual dry grassland perennial *Astragalus exscapus*?

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In central Europe several plant species of dry grasslands are thought to be relicts of late Pleistocene steppe vegetation. Many of these species are particularly rare although presumably there are many suitable but unoccupied habitats. Here I investigate whether habitat requirements, reproduction, and dispersal potential can explain the rarity of the relictual dry grassland perennial *Astragalus exscapus*. In order to assess habitat requirements of the species, vegetation composition and soil characteristics were studied in 37 populations in central Germany. Production and dispersal potential of seeds were investigated in 10 populations, and germination and recruitment were assessed in experimental plots in three populations. Vegetation of the habitats included the majority of dry grassland community types delimited in the central German dry region indicating a broad ecological niche of the species within dry continental grasslands. Soil characteristics of the habitats also spanned a wide range. Seed production was high. 100% of the seeds sown in the laboratory germinated whereas under natural conditions 20% of the seeds developed seedlings. Half of these seedlings survived one year but only 4.5% two years. 90% of the seeds were dispersed less than 50 cm distance indicating a low dispersal potential. I conclude that *A. exscapus* is mainly limited in dispersal but recruitment limitation might also be important in explaining its rarity. Because of a large number of presumably suitable unoccupied habitats across the dry continental grasslands, introduction measures for conservation of *A. exscapus* would likely be successful at many dry continental grassland sites.

Dry grasslands in a mediterranean climate. The case study of Ponza and Ventotene

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The archipelago of the Ponziane Islands, located off the Latium coast in the Tyrrhenian Sea, includes five main islands, Ponza, Palmarola, Zannone, Ventotene, Santo Stefano, and several islets, that were originated, during the Pliocene and the Pleistocene, by volcanic eruption. In the past, they were richly covered by woody plant species that human activities removed. The only island still displaying relevant forest cover is Zannone, which was an hunt reserve. The natural landscape changed mainly in the 18th century, when forests were destroyed because of the spread of cultivations and settlements, and secondary dry grasslands spread all over the islands. This type of grasslands is still present, thanks to the current termomediterranean climate that, with a long dry period from April to August, reduces the possibility of the woody species spread.

Here we present an overview of Mediterranean dry grasslands in the only two inhabited islands, Ponza and Ventotene. This study, with a descriptive approach, suggests, as an example, some preliminary analysis of species that constitute dry grasslands in Mediterranean landscape.

Invasion of Calamagrostis epigejos in sandy dry grassland in the Middle Elbe Valley and its effect and species richness and composition of the vegetation and of grasshopper communities

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The rhizomateous grass *Calamagrostis epigejos* has been expanding in northern Germany during recent decades. Among others, it invades various dry grassland communities to whose biodiversity it is a serious threat.

In an observational study in Höhbeck, Lower Saxony, Middle Elbe Valley, Germany, we analysed how fast *Calamagrostis* polycormons spread into intact dry grassland communities and how much the alter community structure and richness of vascular plants, bryophytes, lichens, and grasshoppers. In an experimental study, we compared the effectiveness of different management techniques aiming at reducing the negative effect of *Calamagrostis* on conservation values. Particularly, we compared ploughing once at the beginning of the experiment, mowing once, twice and four times a year.

We found that the average spreading speed of *Calamagrostis* polycormons into other vegetation types is more than 1 m per year. Shortly after the first culms of Calamagrostis have been found in a plot, the diversity of other plants decreased significantly. In grasshopper communities the highly adapted specialists were replaced by ubiquituous species.

Syntaxonomy and biodiversity of *Festuco-Brometea* communities in Transylvania (Romania) – a preliminary overview

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In the Transylvanian Lowland (Romania), extended dry grasslands still exist that are outstanding in diversity and conservation status compared to European standards. However, this treasure is not well documented so far. Despite a variety of local phytosociological studies by Romanian colleagues, three major issues have hardly been addressed before: (i) arrangement of the vegetation types within a consistent national or supranational classification based on modern methodological approaches; (ii) consideration of the bryophytes and lichens in these dry grassland stands; (iii) description and analysis of the scale-dependent diversity patterns in these communities.

In a joint Romanian-British-German-Turkish cooperation within the EDGG, we aimed at collecting baseline data for all three aspects. For this purpose, we sampled the whole range of *Festuco-Brometea* communities occurring in different sites (many of them within Natura 2000 sites) in Transylvania, mainly in the districts of Cluj and Braşov. We applied two sampling designs, nested-plot sampling with plot sizes ranging from 1 cm² to 100 m² and phytosociological relevés with a standardised plot size of 10 m². In both cases, we sampled vascular plants as well as terricolous bryophytes, lichens, and "algae", recorded major environmental data (altitude, aspect, inclination, microrelief, land use, structural data), and measured fundamental soil parameters.

The studied communities were mostly dominated by grasses, such as *Stipa capillata, S. lessingiana, S. pulcherrima, S. tirsa, Bothriochloa ischaemum, Brachypodium pinnatum, Briza media, Bromus erectus, Festuca rupicola, F. pallens, Helictotrichon decorum, Sesleria heuflerana*, as well as *Carex humilis* and *C. tomentosa*. The stands are also rich in perennial forbs, with genera such as *Campanula, Centaurea, Euphorbia, Inula, Iris, Linum, Potentilla, Salvia, Trifolium*, and *Veronica* represented by particularly many taxa. By contrast, therophytes, succulents as well as bryophytes and lichens are much less represented than in other European dry grasslands. We will present a preliminary proposal, in which higher syntaxonomic units (alliances, orders) to place the Transylvanian communities, based on statistically established (phi values) diagnostic species.

We found very high species richness values at all spatial scales, e.g. if compared to similar dry grassland types in Germany. The highest species densities were recorded in meso-xeric hay meadows (*Cirsio-Brachypodion*). Maximum species richness values were 5 (with 5 vascular plant species) on 1 cm², 8 (8) on 10 cm², 19 (17) on 100 cm², 45 (43) on 1000 cm², 82 (81) on 1 m², 101 (99) on 10 m², and 131 (127) on 100 m². It appears that the values at 1000 cm² and at 10 m² are possibly the highest ever recorded in any plant community worldwide.

We conclude that studying Transylvanian dry grasslands in more detail would be prominently important to understand the causes underlying the described biodiversity patterns and to place the occurring community types into a consistent continent-wide classification scheme. At the same time, these communities represent an outstanding and highly valuable part of Europe's natural heritage that needs stronger conservation efforts, in particular as many of the stands are threatened by land use changes.

Annual vegetation of shifting dunes on the southern Baltic Sea coast

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Active migrating dunes along the Southern Baltic Sea coast have a very specific vegetation of pioneer plants, some of which are endemic to that area. Although large migrating dunes attracted botanists to study their perennial vegetation, the annual pioneer vegetation has usually been neglected. Typical plants on bare soil of active migrating dunes and sand fields in dunes are the endemic *Corispermum intermedium* and the neophytic *Corispermum pallasii* (Chenopodiaceae), *Cakile maritima* subsp. *baltica* (Cruciferae) and *Linaria loeselii* (Scrophulariaceae). Field investigations and herbarium analyses revealed a gradual replacement of the endemic *C. intermedium* by the Siberian neophyte *C. pallasii* (Syn. *C. leptopterum*) for the Baltic coast. Due to confusion with *C. pallasii* the current distribution of *C. intermedium* on the Baltic coast is not clear. We point out that the current synonymy of *C. leptopterum* with *C. intermedium* in the Flora Europaea has negative effects for conservation of the endangered *C. intermedium*. The Cakilo-Corispermetum pallasii is described as new plant community characteristic for the annual vegetation of shifting dunes, marking the sundic-baltic sand dune vegetation complex.

Past land use, landscape structure and current distribution of dry grasslands

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Strong recent changes in land use and landscape structure have initiated research on how these factors influence distribution and dynamics of plant species at the landscape level. Whereas various studies showed the importance of past land use for distribution of some species, little is known about the relationship among landscape structure, past land use and species dynamics at the landscape level.

In our project, we focus on habitats of dry grassland species (e.g. current dry grasslands and abandoned fields) in agricultural landscape. In the study area, we describe changes in land use over the last 60 years and identify changes in the distribution of habitats of these species. We also investigate the importance of abiotic conditions and specific management for the occurrence of dry grassland localities. The analyses are based on analyses of old and current maps using GIS.

In the future we plan to incorporate these data into a dynamical model predicting changes in species distribution in the landscape.

Dry grassland communities of the Starohorské vrchy Mts. (Central Slovakia) and factors affecting their distribution and variability

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A systematic survey of grassland communities of the Starohorské vrchy Mts. resulted in 456 phytosociological relevés, one third of which represents dry grasslands of the *Festuco-Brometea* class. Along with the floristic composition environmental data were recorded in the field (altitude, slope, aspect, percentage cover of all tree, shrub, herb and cryptogam layers), calculated or derived from available GIS digital data layers (heatload calculated from slope and aspect data, type of bedrock, type of soil, mean annual precipitation, mean annual temperature, potential natural vegetation type, phytochorological membership, past and recent management). These environmental variables were used as explanatory in order to explain the distribution of distinct dry grassland types in the study region by Canonical Correspondence Analysis. Additionally, the variability of dry grassland communities was analyzed using the measured variables and Ellenberg indicator values (for light, temperature, continentality, soil reaction, moisture and nutrients) as supplementary variables in Detrended Correspondence Analysis. Altogether, seven dry grassland communities were distinguished in the study region belonging to the following alliances: *Festucion vallesiacae* (1 association), *Bromo pannonici-Festucion pallentis* (1 association), *Diantho lumnitzeri-Seslerion* (1 association), *Bromion erecti* (2 associations) and *Cirsio-Brachypodion pinnati* (2 associations).

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The role of stochastic and deterministic factors for community assembly with special respect to dominant species in dry grassland study system

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The main aim of our project is to get deeper insights into mechanisms of community assembly in the study system of dry grasslands. In particular, we are interested in the relative impact of stochastic and deterministic factors on community composition.
We tested factors responsible for distribution of 4 dominant species at these grasslands and the effect of these dominants on composition of the communities.

We found some differences in soil conditions on localities dominated by different species (*Anthericum ramosum*, *Brachypodium pinnatum*, *Bromus erectus*, *Inula salicina*), but the chemical differences cannot fully explain the observed distribution of the species. We, therefore, want to test the establishment and survival of the four species on different localities to see whether they are the best competitors on localities, where they actually dominate. Furthermore we want to study the impact of dominant species on establishment and survival of other species using artificial mono-dominant communities and sowing seeds of other grassland species.

We assumed that timing of seed arrival and propagule density may be the main stochastic factors influencing community assembly. Hence we tested the role of propagule density and found strong differences in resulting community composition. Now we plan to study effects of timing for colonisation process.

Interactions between the two dry grassland species *Dianthus carthusianorum* and *Festuca rupicola*

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In East Germany, a high percentage of species-rich, semi-natural dry grasslands have been converted into species-poor communities dominated by various grass species. Reasons include the disappearance of low-intensity types of agricultural land-use such as mowing and grazing, as well as an increased level of nitrogen deposition. The expansion of *Festuca rupicola* Heuff., especially in the porphyry landscape near Halle, indicates that competitive relationships are changing in the plant communities, and the biodiversity of species-rich dry grasslands is declining. Low-growing forbs in particular are becoming more vulnerable as a result of the increasing dominance of the grass species. We selected *Dianthus carthusianorum* L. to evaluate the performance of this rare forb in competition with *F. rupicola.*

In order to investigate the interaction of *D. carthusianorum* with the grass species *F. rupicola* we used a replacement design (De Wit 1960), wherein the proportion of species within mixtures was varied, maintaining a constant density of 9 individuals throughout. In September 2007, seeds of *D. carthusianorum* and *F. rupicola* were sown in plastic pots (22 x 19 cm) with a compost/sand mixture (2:3, pH 7.0) and cultivated outside in the Botanical Garden of our institute. We measured the length of stems and the number of flowers per individual of *D. carthusianorum* as fitness parameters and determined the above-ground biomass of the pots. For the statistical analysis we calculated an ANOVA followed by a Tukey`s post hoc test ($p \leq 0.05$).

D. carthusianorum developed significantly more biomass in monoculture (D9) than in mixtures with *F. rupicola,* and *F. rupicola* developed significantly more biomass in monoculture (F9) than in mixtures. *D. carthusianorum* produced between 14 and 24 flowers per individual in all treatments. In mixtures with *F. rupicola* (D3F6) the number of flowers was significantly higher than in the other mixture (D6F3), whereas *F. rupicola* produced far fewer panicles per individual in the 1st year of performance. The calculation of the RNE showed that *D. carthusianorum* suffered significantly more from competitive effects in the treatment with fewer *F. rupicola* individuals (D6F3), and in D3F6, showed a near-neutral reaction. *F. rupicola* also suffered competitive effects in combination with D. *carthusianorum*, but there was no significant difference between the two mixtures.

The results of our experiment show that plant-plant interactions in dry grassland communities vary widely. *D. carthusianorum* and *F. rupicola* show similar competitive effects to one another, but increasing dominance of *F. rupicola* leads to diminished fitness in the other species (e.g. *Campanula glomerata*, *Alyssum montanum*).

Germination biology of eight selected dry grassland species

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The species-rich, dry grassland communities of the porphyry landscape near Halle/Saale host a number of rare dicotyledonous hemicyptophytes. In open fields the species usually flower abundantly and produce many fruits and seeds during the summer. The purpose of this study was to determine whether such germination behaviour represents the main cause for the species' apparent rarity. Eight distinct dry grassland species were collected and their germination behaviours following harvesting and hibernation under field conditions were monitored in order to determine their optimal germination conditions and seed bank type.

Study species: *Astragalus danicus* Retz. (Fabaceae): perennial hemicryptophyte; *Carlina vulgaris* L. (Asteraceae): hapaxanthous hemicryptophyte; *Erysimum crepidifolium* Rchb. (Brassicaceae): short-living hemicryptophyte; *Hypochaeris radicata* L. (Asteraceae): short-living hemicryptophyte; *Leontodon hispidus* L. (Asteraceae): perennial hemicryptophyte; *Prunella grandiflora* (L.) Scholler (Lamiaceae): perennial hemicryptophyte; *Pulsatilla vulgaris* Mill. (Ranunculaceae): perennial hemicryptophyte; *Stachys recta* L. (Lamiaceae): perennial hemicryptophyte

Seeds were collected from semi-dry grassland near Halle/Saale.
The conditions in the climate chamber were as follows: 8/4 °C at 12 hours light / 12 hours dark; 20/ 10 °C at 12 hours light / 12 hours dark; 32/20 °C at 12 hours light / 12 hours dark. Thirty batches of seeds (n = 4) were put on filter paper in Petri dishes and were kept permanently moist with de-ionized water. All germinated seeds (radicula being visible) were counted every two to three days and the duration of the experiment was 45 days. The same procedure was repeated in spring of the following year after seed hibernation in the field.

For data analyses we calculated the percentage of final germination and germination velocity using the modified Timson´s Index. Plots of the raw data were visually inspected for deviations from normality and variance homogeneity. Inspection of the raw data, non-significant Kolmogorov-Smirnov-test and a Bartlett´s test confirmed that there were no serious deviations from ANOVA assumptions. Multiple comparisons were performed using a parametric one-way ANOVA along with Tukey`s post hoc test ($p<0.05$) and a two way ANOVA. Percentages were arcsin-transformed prior to analysis.

The results showed that germination of *Astragalus danicus* after harvest was generally low, but was highest under hot conditions. Following hibernation, germination was similarly low under all three temperature/light conditions. *Carlina vulgaris* seed germination after harvest was highest under warm and hot conditions; after hibernation all seeds germinated completely under all temperature conditions. Seeds of *Erysimum crepidifolium* all germinated under warm conditions after harvest while after hibernation germination was greatly reduced. *Hypochaeris radicata* germinated highest under warm conditions after harvest and after hibernation the seeds germinated to a greater extent, but also highest under 20/10 °C. The germination of *Leontodon hispidus* seeds increased with increasing temperature after harvest, and after hibernation germination was a little higher. *Prunella grandiflora* seeds germinated highest under warm und hot conditions after harvest while after hibernation germination was greatly reduced. *Pulsatilla vulgaris* seeds germinated highest under warm und hot conditions after harvest, but after hibernation germination was reduced. Very few of the *Stachys recta* seeds germinated after harvest as well as after hibernation.

The results of the experiment show that the germination biology of the perennial hemicryptophytes of dry grassland communities is very different. I conclude that six species build up a transient (*Carlina vulgaris, Erysimum crepidifolium)* or short-term persistent (*Hypochaeris radicata, Leontodon hispidus, Prunella grandiflora, Pulsatilla vulgaris)* seed bank, whereas two species (*Astragalus danicus, Stachys recta)* belong to the long-term persistent seed bank type. This implies that a lot of dry grassland species are vulnerable to isolation in space and time as well as changing environmental conditions.

Comparison of plant assemblage between grazed and abandoned upland pastures in a calcareous area of Western Stara Planina, Bulgaria

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The issue on the effects of farmland abandonment is not less valuable for biodiversity conservation than the issue on farmland intensification, but so far it obtains much less attention. This information is especially scarce from Eastern Europe. The aim of the present study is to assess the effect of land abandonment on plant species composition and occurrence in the upland pastures of western Bulgaria. The study area was located in NATURA 2000 site Ponor which is a part of Western Stara Planina and represents a typical calcareous pastoral area for Bulgaria. In 2008, a total of 139 elevés (4 x 4 m) were randomly located within the area and data on vegetation composition and structure, grassland use, and five environmental variables were collected. Overall 280 plant species, belonging to 42 families, were identified and some of them had high conservation status (13 Balkan endemics were found). Plant species richness and vegetation cover were influenced by soil depth and moisture, altitude and pastures' use. Comparison of plant assemblages between grazed and abandoned upland pastures showed that land abandonment affected vegetation structure. There were significant effects on height and cover, but not on species richness. Responses to land abandonment were mostly species-specific within the studied groups of gramineous plants, leguminous plants, sedges and rushes, and herbs. Implications for conservation of plant diversity through sustainable management of studied habitat were made.

Interpretation and Conservation Status of the EU Habitats Directive Dry Grassland Habitats in Latvia

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In Latvia dry grasslands occupy only about 1200 ha, but they are indispensable both for maintenance of biological diversity and also as an important element of the cultural-historical landscape in river valleys. The aim of the present research was to assess the current conservation status of protected dry grassland habitats in Latvia. Conservation status was analysed using

guidelines for assessment, monitoring and reporting under article 17 of the Habitats Directive (European Commission, 2006).

Three dry grassland habitat types listed in the Annex I of the EU Habitats Directive occur in Latvia: 6110* Rupicolous calcareous or basophilic grasslands of the Alysso-Sedion albi, 6120* Xeric sand calcareous grasslands, and 6210 Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia).

Interpretation of these habitat types is quite broad in Latvia to ensure the protection of all valuable dry grassland plant communities. For example, the habitat type xeric sand calcareous grasslands (6120) include not only communities of the alliance *Koelerion glaucae* but also those of the alliance *Plantagini-Festucion*.

Although 89 % of the total area of dry grasslands is included in Natura 2000 sites criteria for favorable conservation status is not fulfilled. The area covered by dry grassland habitats was assessed as bad and deteriorating, specific functions and structure was also bad, and future prospects were assessed as inadequate. Thus, the overall assessment of conservation status for 6120 and 6210 in Latvia was bad. The main reasons for bad current status and not promising future prospects are abandonment of traditional cultivation practices and urbanization.

Arable to grassland succession - species diversity in time and space

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We will present a new research project on species chronosequences and temporal changes in diversity during the arable-to-grassland succession. The main focus of the project will be a local agricultural landscape on the Baltic island of Öland where we have data on landscape structure and land-cover over the last three centuries. The project aims to analyse changes in species richness and evenness, as well as the population densities of chosen species, in relation to past and present landscape structure and present-day environmental variables. The project will also include comparisons with grassland landscapes in southern Germany

Potential effects shared pollinators on grassland composition along a productivity gradient

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Plant communities are shaped by several mechanisms, including environmental conditions, direct interactions between species and indirect interactions with other groups, such as pollinators and herbivores. In recent years, empirical work showed that besides competition, positive interactions

(facilitation) play an important role in shaping biodiversity: on the population level, certain species (i.e. benefactees) were proved to perform better in the vicinity of facilitating species (the benefactors). When this process employs indirect interactions, the presence of the benefactors increases the activity of another group (possibly of different trophic level) whose services are then promoting the fitness of the benefactees. For example, plants with small flowers or with little reward may be limited by the amount of visiting pollinators. If such species grow in spatial association with more attractive species, their pollination rate may be enhanced. Such a profit is expected only if the benefit to species fitness through the increase in patch attractiveness and visitation rate is higher than the costs due to competition among species within the community. Species may compete on pollinator services (i.e. more attractive species deter pollinators from visiting the less attractive ones) or on resources (i.e. competition on nutrient or light). Here we present first results from a field experiment in which we assessed the probability and nature of such indirect positive interactions in relation to environmental conditions. We conduct our field experiments in three grasslands, representing various productivity levels along the Swabian Alb, Germany. In each grassland, a set of similar vegetation patches were chosen as sampling quadrats. In each of the quadrats, all flowers of a single species which may act as magnet species and attract pollinators were removed. Observations on pollinator visitation to these manipulated quadrats were compared to the visitation rate in control quadrats, where the potential benefactor species existed. Using comparison between species within grassland and between similar species among grasslands, we compared the impact of shared pollinator services on grassland species composition, and assessed their relative importance in relation to grassland productivity.

Subxerophilous and mesophilous grasslands of the White Carpathian Mts. in Slovakia

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The vegetation of meso- and subxerophilous grasslands of the White Carpathian Mts. in Slovakia was studied using the Braun-Blanquet approach. These stands are famous for their high species richness: sometimes, up to 80 species of vascular plants may occur in a plot of just 25 m^2. Such incredible species diversity is a result of the long-term care of grasslands (regular mowing and grazing) and rather variable environmental conditions. We collected 343 phytosociological relevés from subxerophilous and mesophilous grasslands from the Slovak part of White Carpathian Mts. For the syntaxonomical analysis we used numerical methods and expert system for identification of grasslands in Slovakia. Nine associations were distinguished: from the alliance *Bromion erecti* two associations (*Brachypodio pinnati-Molinietum arundinacae*, *Onobrychido viciifoliae-Brometum erecti*), from the alliance *Cirsio-Brachypodion pinnati* two associations (*Scabioso ochroleucae-Brachypodietum pinnati*, *Polygalo majoris-Brachypodietum pinnati*), from the alliance *Arrhenatherion elatioris* four associations (*Ranunculo bulbosi-Arrhenatheretum*, *Pastinaco sativae-Arrhenatheretum elatioris*, *Anthoxantho-Agrostietum tenius*, *Poo-Trisetetum flavescentis*) and from the alliance *Violion caninae* one association (*Festuco capillatae-Nardetum strictae*).

The main gradients in species composition were analyzed by the Detrended Correspondence Analysis. For the ecological interpretation of ordination axes, the average Ellenberg indicator values for relevés were plotted onto DCA ordination diagram as supplementary environmental data. The Ellenberg indicator values for every association were illustrated in box-and-whiskers plots. For each relevé the information on various ecological factors were determined and recorded - topographical factors (aspect, inclination, altitude, radiation), biological variables (cover of both herb and moss layers, litter cover), as well as the management (grazing, mowing, abandonment). By means of geographical coordinates the additive data were obtained from the GIS digital layers for each relevé (total annual precipitation, average annual temperature, type of geological bedrock, type of soil). These variables were used in direct ordination for explanation of the variability in the studied vegetation.

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Flowering regime of two closely related xerothermic plant communities under extreme shifts of dry and humid weather conditions

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From the end of April 1993 to October 1995, phenological observations in permanent plots were carried out in dry dwarf-shrub heaths (*Euphorbio-Callunetum*) and acidophilic rock communities (*Thymo-Festucetum cinereae*) on porphyry outcrops near Halle/Saale, Germany.

In the three years of observation, strong deviations from the long-term average climatic conditions emerged. In 1993 and 1994, precipitation was higher than -average during the vegetation period, except two dry periods in early spring and late summer of 1993 and a mid-summer drought in 1994. After these extreme shifts between wet and dry conditions, the vegetation period in 1995 was characterized by well-balanced humidity.

The impact of droughts and humid conditions on the numbers of flowers and the time interval of flowering is shown for selected species of the two plant communities. Differences between the communities are discussed, and predictions for the future flowering regime under climate change are made.

Population structure of *Pulsatilla patens* (L.) Mill. in the site "Grasslands in the Military Training Grounds in Orzysz" (NE Poland)

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Pulsatilla patens is a threatened plant in Europe, listed in the Bern Convention and Aneks II of the European Habitats Directive. This rare species is protected and mentioned in the Red Data Book of Poland. *Pulsatilla patens* is destroyed by wild life, eutrofication of biotops, destruction of

habitats, gathering and transplaning into garden-plots. In order to sustain the current population level and the size of the area in which they are spread, the national plan of preservation of the species was put in place in 2007.

This paper presents the first step of investigation of population structure of *Pulsatilla patens* in Masurian Lake District macroregion in NE Poland. This species was noticed in a few locations, but most of the time those populations are not many specimen. A well preserved population of *Pulsatilla patens* is protected within the site "Grasslands in the Military Training Grounds in Orzysz" in Masurian Plain mesoregion (the Natura 2000 network). This population is divided into 5 subpopulations. In late April and early June 2009 a study took place. It's aim was the qualification of the total population size, density of individual plants of the 49 plots of 2 m x 2 m. In each subpopulation all individuals was recorded and classified into life cycle stages: flowering adult, vegetative adult and juvenile. In all plots, the total cover of phanerogams, cryptogams, litter and the cover of bare soil were recorded to characterize habitat quality.

316 individuals of *Pulsatilla patens* were counted - 62 flowering adults, 202 vegetative adults and 52 juveniles. The number of flowers per individual varies from 1 to 12, the average being 3 flowers. Only two individuals had fruits. The small amount of juvenile plants and the lack of the ability to give fruit detected in 2009 are the two main factors leading to the conclusion that the described population is characterized by a very limited possibility to rejuvenate.

Research strategies for the investigation of climate change impact on Central European grassland ecosystems

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Impacts from changes in the global climate are increasingly manifesting themselves in terms of the regional sphere. Ecological impacts in all their dimensions are still not completely visible to date. Hence, it is important in climate and ecological systems research to keep abreast of the challenges we are facing. Long-lived ecosystems, such as grasslands, can be expected to be considerably impacted by future climate change.

Central questions are: How do extreme climatic conditions (e.g. drought and torrential rains) affect organisms and the characteristics of ecosystems and functions? How are ecological processes, such as the production of biomass or the interaction between animals and plants, affected? How resilient are our grassland ecosystems?

Within the interdisciplinary FORKAST consortium the research projects focus on model-ecosystems and aim to analyse and predict the impact of climatic processes on vegetation, fauna, microorganisms, biotic interactions, bio-diversity, soil ecology, balance of matter and ecosystem functions. Up-to-date developments in methodology are continuously implemented and combined within the research cooperation. In this manner, the various qualities of monitoring, manipulative experiments and modelling (i.e. simulations) can be optimally combined. The fundamental

research results may offer opportunities for implementation in society in, for example, planning of spaces and nature conservation.

Excursion 1:

The porphyry landscape near Halle (Saxony-Anhalt, Germany) – an example of fragmented landscape

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Fig. 1: Porphyry outcrops between Brachwitz and Grimritz (near Halle, Saxony-Anhalt; Photo: PARTZSCH 2009)

On account of its species-rich habitats, the landscape of the porphyry outcrops in the lower valley of the river Saale near Halle has been selected to be part of a 'Fauna-Flora-Habitat area'. More than 200 porphyry outcrops, strongly differing in size and genesis, and embedded in a landscape agriculturally intensively used for centuries, represent the peculiarity of this area. Because of particular climatic and edaphic conditions, the vegetation is characterised by associations of (sub)continental, (sub)mediterranen, subaltlantic as well as widespread Central-European species. The main distribution areas of some of these floristic elements and their characteristic vegetation types are outside of central Germany. In our region, they represent outposts of an extrazonal vegetation. The porphyry outcrops are characterised by a mosaic of different, partly rather rare plant communities. Depending on edaphic and climatic conditions, there are sand and porphyry pioneer communities (*Thymo-Festucetum cinereae*), acidophilic dwarf-shrub heaths (*Euphorbio-*

Callunetum), silicate grasslands (*Galio-Agrostidetum (tenuis)*, *Filipendulo vulgaris-Helictotrichetum pratensis*), continental dry and semi-dry grasslands (*Festuco valesiacae-Stipetum capillatae, Festuco rupicolae-Brachypodietum pinnati*, *Festuco rupicola*-community), half ruderal grasslands (*Falcario-Agropyretum repentis, Convolvulo-Agropyretum repentis*, *Poa angustifolia*-community), meadows (*Arrhenatheretum elatioris)*, ruderal communities (*Sisymbrio-Atriplicetum oblongifoliae)* as well as shrub and tree stands. In total, we found on the porphyry outcrops 50 plant communities and more than 370 plant species.

On the base of these floristical and phytosociogical data, different analyses have been carried out. Because of the island-like structure of the landscape concerned, the validity of the island theory of MACARTHUR & WILSON (1967) could be proven. Beside a high degree of isolation of the outcrops, a close connection between increasing numbers of species and increasing sizes of the communities could be pointed out, showing that rare and endangered species and plant communities only grow on older and larger outcrops, due to a higher heterogeneity of habitat and microclimatic conditions. On smaller and younger outcrops the number of ruderal species and communities is very high, whereas rare and endangered plants and xerothermic communities are more abundant in larger and older outcrops. Some of these plant taxa are considered relict species of the ice age adopted to very old habitats, being indicators for historically old xerothermic grasslands.

Nowadays the invasion of alien plant species into the natural vegetation is a worldwide phenomenon, caused by expanding world trade, tourism, destruction of landscapes as well as global climatic changes. Therefore, it was interesting to put the question which chances to be established in the semi-natural grassland vegetation do these adventive plants (archaeophytes and neophytes) have, taking into consideration that the number of such plants increased in the course of the last four decades. The degree of invasion of alien plants depends on the structure of the vegetation as well as the degree of hemeroby or naturalness of the plant communities. Plant communities may tolerate invasive plants as long as the associations are in a kind of equilibrium with the determining abiotic and biotic factors of the habitats.

An indirect comparison of the current vegetation with historical releveés from 1950 und 1960 showed an increase of the ruderal species, depending on the vegetation structure of the particular communities. In spite of some changes in the composition of plant species, the xerothermic communities are relatively consistent, above all because of extreme climatic and habitat conditions. However, the ending of land use by sheep grazing at the beginning of the 1990ies strongly endangers the vegetation structure due to succession processes.

A direct comparison of the vegetation on the small porphyry outcrops (< 500m²) within the time of 8 years showed very high dynamics, influenced by lacking niches and habitat differentiation and impacts of the surrounding agrarian landscape. Because of lacking buffer zones, edge-effects have stronger influences, and the abundance of species as well as changes within the plant communities are strongly influenced by stochastic effects.

Results of previous analyses could be validated by means of modern multivariate methods (cluster analyse, correspondence analyse).

Investigations of the seed banks of different plant communities showed the following results. The number of seedlings coming up from the seed banks as well as the number of species strongly

varied between the particular plant communities, but increased significantly with rising degree of hemeroby. The seed banks showed a seasonal rhythm. Similarities between particular seed banks and the actual vegetation are low (20 to 40 %). The seed banks are mainly built up by species having long-term persistent diaspore bank types, whereas numerous xerothermic species are characterised by ephemeral diaspores. The number of species with transient seed bank type decreased in communities with increasing degree of hemeroby, but species with long-term persistent seed bank type increased. The reproductive potential of the seed banks of xerothermic vegetation with a higher degree of nativeness was low. The seed bank of grassland communities on historically old sites were characterised by smaller numbers of species, compared with those from younger sites. Hence, the renewal and re-establishment of species-rich xerothermic plant communities are difficult long-term processes, which should be taken into consideration in management concepts.

References:

MAHN, E.-G. 1965: Vegetationsaufbau und Standortverhältnisse der kontinental beeinflußten Xerothermrasengesellschaften Mitteldeutschlands. – Abhandlungen der Sächsischen Akademie der Wissenschaftne zu Leipzig, Mathematisch-naturwissenschaftliche Klasse **49**(1): 1–138.

MEUSEL, H. 1940: Die Grasheiden Mitteleuropas. Versuch einer vergleichend pflanzengeographischen Gliederung. – Botanisches Archiv **41**: 337–519**.**

PARTZSCH, M. (2007): Flora, Vegetation und historische Entwicklung der Porphyrkuppenlandschaft zwischen Halle und Wettin (Sachsen-Anhalt). – Schlechtendalia 15: 1-91.

Excursion 2:

Populations of *Dictamnus albus* L. (Burning Bush) in thermophile fringes of the lower Unstrut-valley (Saxony-Anhalt)

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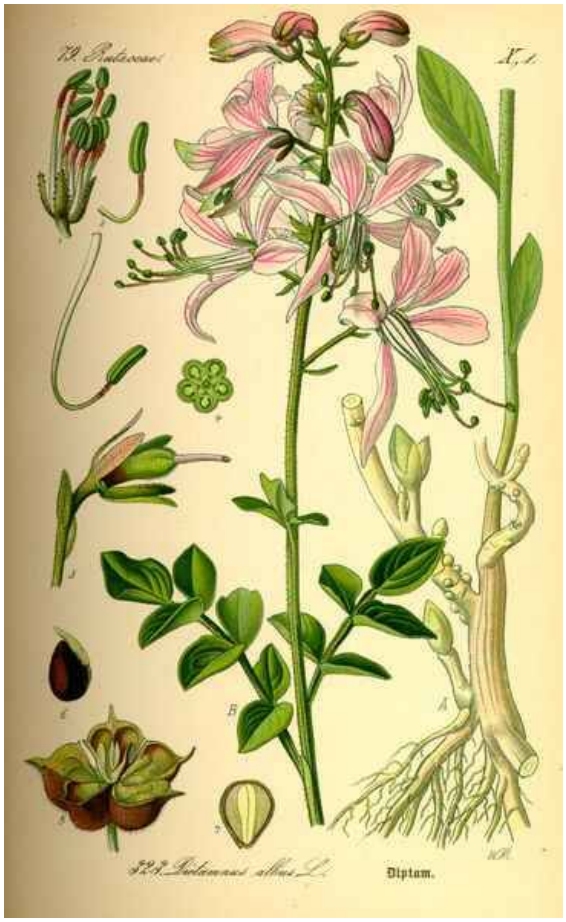
Fig. 2: *Dictamnus albus*-fringe nearby Balgstädt (Photo: S. SCHIEBOLD 2004).

Dictamnus albus (Burning Bush) represents a rare, endangered and protected plant species of our native flora. The species occurs along natural and anthropogenic timber lines along thermophile fringes (*Geranio-Peucedanetum*) and migrates into bordering xerothermic grasslands (*Teucrio-Seslerietum, Trinio-Caricetum, Onobrychido-Brometum*), shrublands (*Viburno-Cornetum*) and woods (*Quercetum pubescenti-petraeae, Galio-Carpinetum*). Seven populations with 200 to 24,000 shoots were investigated in the region of the river Unstrut in the surrounding area of Freyburg (Saxony-Anhalt). All populations produced many flowers and fruits throughout the five years of our investigation.



Study species

Dictamnus albus (Burning Bush, Rutaceae) is a long-lived perennial characterised by a pseudo-rhizome and thick storage roots (JÄGER et al. 1997) Its distribution area covers the meridional and warm-temperate regions of Europe, Central-, and Eastern Asia.

Developing stage (following JÄGER et al. 1997:

seedlings:	1- 3 years old
juvenile shoots < 20 cm:	4-5 years old
juvenile shoots > 20 cm:	6-7 years old
adulte shoots:	8-30 years old

Fig. 3: *Dictamnus albus* – Diptam (Burning Bush; Rutaceae) (after HEGI)

Study area

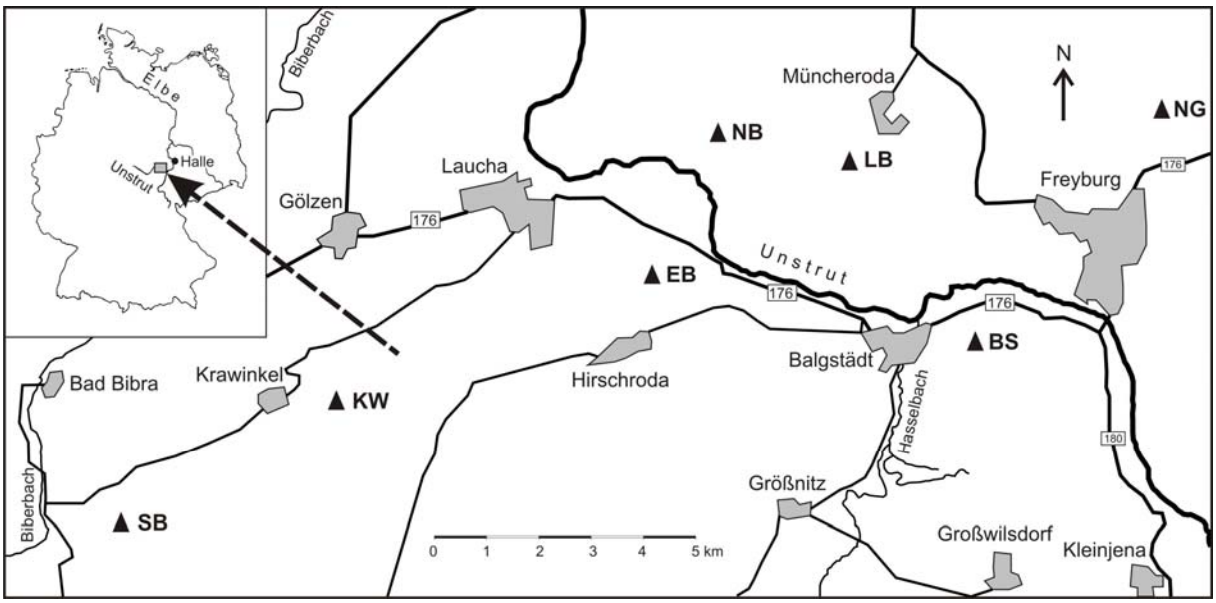


Fig. 4: Location of the study region and the investigated populations of *Dictamnus albus* in the lower Unstrut valley (BS: Balgstädt, EB: Ennsberg, KW: Krawinkel, LB: Langer Berg, NG: Neue Göhle, NB: Nüssenberg, SB: Steinbach)

Locations of excursion:

Neue Göhle (large population: *ca*. 24.000 flowering shoots)
Ennsberg (mediate population: *ca*. 2.000 flowering shoots)
Krawinkel (small population: *ca*. 220 flowering shoots)
Langer Berg (small population: *ca.* 250 flowering shoots)

Climate conditions:

Rain shadow region of the Harz mountains and the Thuringian Forest Mountains
Low annual precipitation of approximately 450-550 mm
Mean annual temperature between 8,5 and 9,5 °C (January: 0 °C; July: 18 °C)

Plant communities:

Population	**Woods**	**Scrubland**	**Fringe**	**Xerothermic grasssland**
Ennsberg	scattered pine forest	-	Geranio-Peucedanetum	Onobrychido-Brometum erecti
Krawinkel	Galio-Carpinetum	Viburno lantanae-Cornetum sanguinei	Geranio-Peucedanetum	Onobrychido-Brometum erecti
Langer Berg	Quercetum pubescenti-petraeae	-	Geranio-Peucedanetum	Teucrio-Seslerietum
Neue Göhle	Galio-Carpinetum	Viburno lantanae-Cornetum sanguinei	Geranio-Peucedanetum	Trinio-Caricetum humilis

The demographic structure of *Dictamnus albus* was studied along transects for which the number of seedlings, juvenile shoots lower and higher than 20 cm, and the number of adults were counted. The results showed that the number of shoots per m², and the proportion of different age stages, varied between grasslands, fringes, shrubs and woods: the proportion of adults and juveniles higher than 20 cm was very high along the fringes, the proportion of seedlings and juveniles under 20 cm was high in the bordering grasslands. There was also a difference between the dry grasslands (high number of seedlings) and the semi-natural, semi-dry grasslands (low number of seedlings). The proportion of the stages between populations also differed. For example, the small

population of Krawinkel was characterised by a lack of seedlings and juveniles – indicating vulnerability due to the excess of adult individuals. This was, however, not a general feature of small populations as in the small population Langer Berg there was a high number of seedlings and juveniles (*c.* 88%). The Ennsberg population was classified as founder population with *c.* 50% of seedlings. The results of the analysis of the age stages allowed us to distinguish between dynamic, stable and senile populations of *Dictamnus albus*. Thus, our study contributes to the categorisation of populations viability.

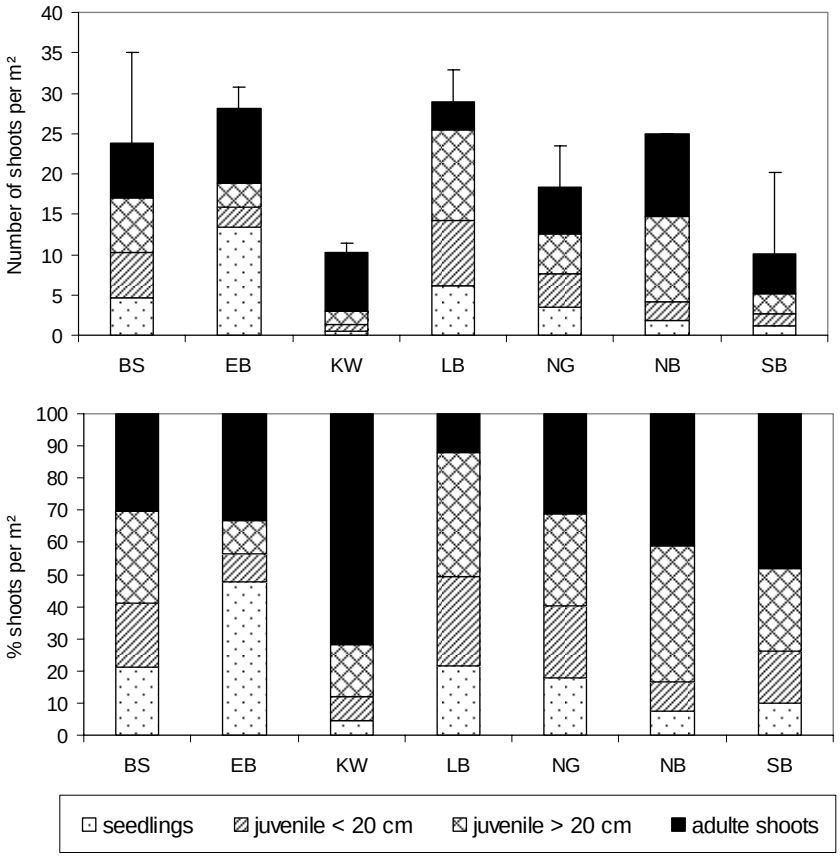


Fig. 5: Absolute number of shoots per m² (above) and percentage of the developing stages (below) of *Dictamnus albus* in the 7 populations of the lower Unstrut valley. There are shown the mean values of the age stages on the whole transects in all years (Balgstädt, Krawinkel, Langer Berg: n=5; Ennsberg, Neue Göhle, Steinbach: n=4; Nüssenberg: n=1). The standard deviations show the variation of the whole number of shoots per 1 m² of the transects during the years 2004-2008.

Due to the high proportion of seedlings and juveniles observed in the xerothermic grasslands we investigated whether *Dictamnus albus* was in the process of encroaching on this habitat. The higher temperatures on the grassland habitat imply high-stress conditions for *Dictamnus albus*, as measured by the stomatal conductance. Results indicated that the seedlings of *Dictamnus albus* suffer under such conditions and consequently fail to achieve their adult stage in the grassland stands. *Dictamnus albus* is therefore a typical fringe or edge species with its ecological niche being defined by thermophile timber lines.

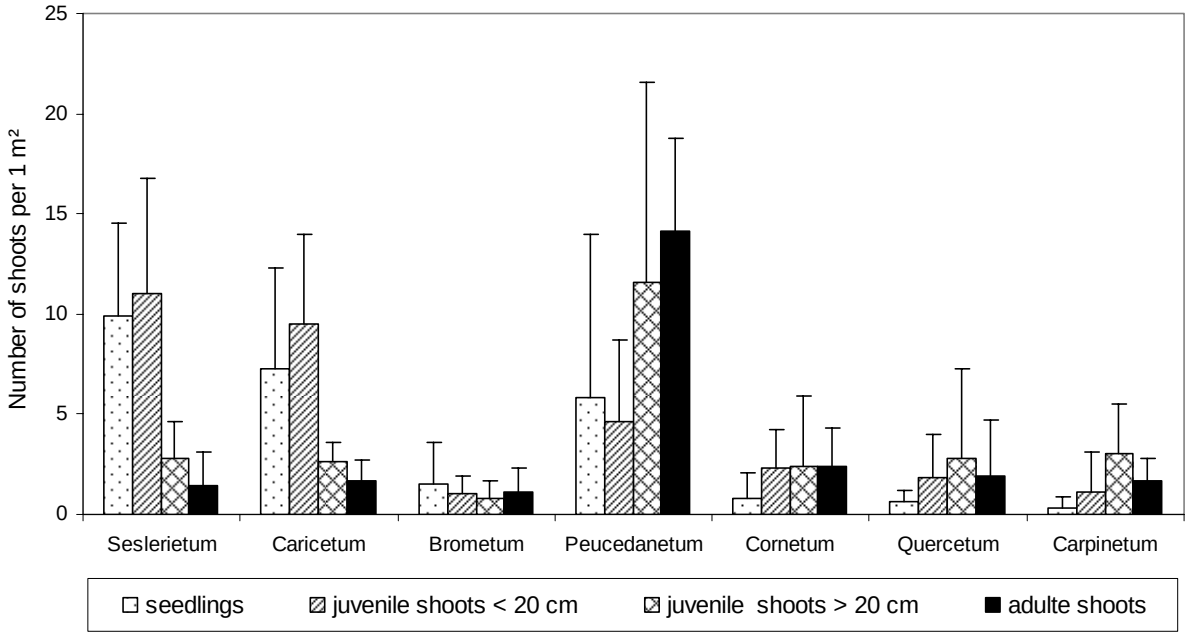


Fig. 5: Population structure of *Dictamnus albus* in the different plant communities in the lower Unstrut valley

References:

HENSEN, I. & WESCHE, K. (2006): Relationships between population size, genetic diversity and fitness components in the rare plant *Dictamnus albus* in Central Germany. – Biodiversity and Conserv. 15: 2249-2261. Dordrecht.

JÄGER, E.J., JOHST, A. & LORENZ, H. (1997): Wuchsform und Lebensgeschichte von *Dictamnus albus* L. (Rutaceae) 1. Beitrag zur Wuchsform und Biologie der Gefäßpflanzen des Hercynischen Raumes. – Hercynia N.F. 30: 217-226. Halle.

PARTZSCH, M. (2007): Populationsstruktur und Vergesellschaftung von *Dictamnus albus* L. in thermophilen Säumen des unteren Unstruttals (Sachsen-Anhalt). – Tuexenia 29: 63-82.

PUBLICATION OPPORTUNITIES

We have been offered the possibility of submission of selected contributions for publication in Special Features of the two geobotanical journals **Hercynia** (for regional topics) and **Tuexenia** (for supra-regionally relevant topics). Further details on these publication opportunities will be provided at the conference homepage and during the conference.

Hercynia is a scientific journal with a long tradition dedicated to publish contributions based on regional research projects with a broader general interest. Preferred are papers dealing with basic or applied investigations in vegetation science including population biology. Papers should be submitted in German or English language (for further instructions see: www.hercynia.uni-halle.de). The editors of Hercynia have us offered, papers of the Dry grassland meeting submitted until to the middle of September to publish after acceptance in the last issue 2009, if later submitted in the first issue 2010 of Hercynia.

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