Vegetation Databases and Climate Change

9th international Meeting on Vegetation Databases

Hamburg, 24–26 February 2010

Book of Abstracts

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Hamburg, 2010

Editors: Dr. Jürgen Dengler, Dr. Manfred Finckh & Prof. Dr. Jörg Ewald

The 9th international Meeting on Vegetation Databases was organised by:

Section Biodiversity, Evolution and Ecology,
Biocentre Klein Flottbek and Botanical Garden,
University of Hamburg

German Federal Agency for Nature Conservation (BfN)
http://www.bfn.de/

Section Vegetation Databases,
Netzwerk Phytodiversität Deutschland (NetPhyD) e. V.
http://netphyd.floraweb.de/?q=node/42

The 9th international Meeting on Vegetation Databases was supported by:

BIOTA AFRICA
(funded by the German Federal Ministery of Education and Research, BMBF)
http://www.biota-africa.org/

European Dry Grassland Group (EDGG)
http://www.edgg.org

Hochschule Weihenstephan-Triesdorf

Floristisch-soziologische Arbeitsgemeinschaft e. V.
http://www.tuexenia.de/

Wiley-Blackwell, Publishing House

Working Group EcoInformatics,
International Association for Vegetation Science (IAVS)
http://www.bio.unc.edu/faculty/peet/vegdata/

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Preface

Dear colleagues,

we wish you a warm welcome to the 9th international Meeting on Vegetation Databases in Hamburg, dealing with "Vegetation Databases and Climate Change". This series of annual conferences has been organised by the German Working Group "Vegetationsdatenbanken" since 2002 at various universities throughout Germany. With the years, the conferences became bigger and more international step by step. Meanwhile the Working Group has become a section of the newly founded Netzwerk Phytodiversität Deutschland (NetPhyD) and it closely cooperates with the Working Group on EcoInformatics of the International Association for Vegetation Science (IAVS).

This year, with the link to "climate change" the topic of the conference obviously is so "hot" that it attracted far more participants than in any of the previous years. With nearly three times as many participants than the average of the last eight years, it was a real challenge to us organisers. Now we expect 150 participants from 30 countries (present affiliation, but when the nationality is considered it would be nearly 40 countries) and all continents. Also the number of keynote lectures (3), regular talks (25), posters (65), and the workshops (5) exceeds that of any of the eight preceding meetings, and probably makes the Hamburg meeting the biggest ecoinformatics conference so far. Apart from the size, there will be some other novelties, including a conference dinner (on Thursday), prizes for the best oral and poster contributions by young colleagues (below 34 years in age), and the option to publish the conference contribution in a Special Feature of *Applied Vegetation Science* and a Special Volume of *Biodiversity & Ecology*.

We are grateful to the German Federal Agency for Nature Conservation (BfN), the project BIOTA AFRICA, and the Floristisch-soziologische Arbeitsgemeinschaft e. V. for substantial financial support, to the Biocentre Klein Flottbek and Botanical Garden of the University of Hamburg and particularly to the section "Biodiversity, Evolution and Ecology of Plants" for the possibility to use the Biocentre as venue and for organisational support, and to Wiley-Blackwell for providing ball pens for the delegate packages and book prizes for the young investigator competition.

We hope that during the days of the conference you get new insights in the dynamic field of ecoinformatics and use the time to establish or renew contacts to colleagues all around the world who deal with similar topics and last but not least enjoy the hospitality of Hamburg and its people.

Lüneburg, Hamburg, and Freising, 20 February 2010

Jürgen Dengler, Manfred Finckh & Jörg Ewald

(Organizing Committee)

Announcements

Young Investigators Prizes

There is a competition for the best oral and poster contributions by a young investigator (i.e. below 34 years in age). The one or two outstanding presentators in each of the two categories will receive attractive book prizes. If you are eligible and want to participate in the competition, but have not registered yet, please do so as soon as possible (prior to your presentation!) in the conference office. While the best lectures will be determined by an appointed jury, all participants are invited to contribute to the choice of the best posters (see instructions in your delegate pack).

Dinners

Wednesday, 19:30 hrs: **Café Altamira** (Tapa bar), Bahrenfelder Str. 331, Hamburg-Ottensen, http://www.cafealtamira.de/ (à la carte; a limited number of non-registered participants may join)

Thursday, 19:30 hrs: **Conference dinner** in the student cafeteria next to the lecture hall (Italian-style buffet; admission only with ticket; ask in the conference office if there are tickets left; price: 22,00 € regular and 15,00 € reduced, including one drink)

Friday, 19:30 hrs: **Knips**, Jürgensallee 51, Hamburg-Klein Flottbek, http://www.knips-hamburg.de/ (à la carte; a limited number of non-registered participants may join)

Special Feature in *Applied Vegetation Science*

We plan a Special Feature in the journal *Applied Vegetation Science* (AVS; impact factor: 1.305) on *Ecoinformatics and climate change*, guest-edited by J. Dengler, J. Ewald, I. Kühn & R. K. Peet. We would appreciate to have the most outstanding contributions of the conference combined in this Special Feature. As we aim at having it published in the last issue of 2010 (13-4), the production schedule is very strict. If you are interested, please notify J. Dengler as soon as possible, but not later than the conference, and preferably provide an abstract already prepared in AVS style (up to 250 words and structured into the sections Question, Location, Methods, Results, and Conclusions). On or shortly after the conference the guest editors together with the chief editors will screen the offered contributions and make a preselection, whose authors will then be invited to submit their articles for review by end of April 2010 at the latest.

Special Volume of *Biodiversity & Ecology*

There will be a Special Volume of the journal *Biodiversity & Ecology* (see http://www.biologie.uni-hamburg.de/bzf/syst/journal_be_eng.htm) on *Vegetation databases for the 21th century* to be published by end of 2010, too. This Special Volume (approx. 200–300 pages) will be guest-edited by J. Dengler, J. Ewald, M. Finckh, F. Jansen, J. Oldeland (and potentially also R. K. Peet). This publication is also peer-reviewed and particularly attractive as it is published in full colour, both open access online and in print format, and this without any page charges. Moreover, there are no page limitations as long as the length is justified by the content. All contributions from the conference are eligible for this Special Volume. You can submit your "regular papers" (for "database reports", see below) prepared according to the instructions-to-authors (available on the journal homepage) without invitation until 30 June 2010. Please do this electronically to dengler@botanik.uni-hamburg.de.

World Metadatabase on Vegetation Databases

We plan to establish a comprehensive overview of existing databases of vegetation relevés worldwide to be published in print format (as second part of the Special Volume of *Biodiversity & Ecology*, see above) and as a continuously updated open-access online metadatabase. If you have a database that you wish to be included in the print volume and in the metadatabase, please register this database at http://www.botanik.uni-greifswald.de/373.html. Then you will receive all relevant information on the next steps automatically. Please do not submit any further information or manuscripts before you have received these detailed instructions.

Programme

Wednesday, 24 February 2010

Workshops

08:30–09:30		**Registration desk open**
09:30–18:00		**Workshop 1 (Autocorrelation)**
11:00–11:20		**Coffee break**
11:20–13:00		**Workshop 1 (Autocorrelation)**
13:00–14:00		**Lunch break**
14:00–16:00		**Workshop 1 (Autocorrelation) and Workshop 2 (BIOTABase)**
16:00–16:20		**Coffee break**
16:20–18:00		**Workshop 1 (Autocorrelation) and Workshop 2 (BIOTABase)**
18:00–19:00		**Space for optional meetings & registration desk open**
19:30		**Option for joint dinner in restaurant (Altamira in Altona)**

Thursday, 25 February 2010

	08:00–08:30		**Registration desk open**
	08.30–08.45	**Welcome**	**Ewald, Krüß, Jürgens & Finckh**
	Topic: Species distribution models		
Session 1	**08:45–09:30**	**Keynote 01**	**Zimmermann:** Vegetation databases and climate change – conceptual and theoretical aspects in forecasting future species responses
Session 1	**09:30–09:45**	**Talk 01**	**Döhler et al.:** Climatic limitation – searching for key determinants of plant distribution boundaries
Session 1	**09:45–10:00**	**Talk 02**	**Fitzpatrick et al.:** Evaluating environmental niches across space and time: biological signal or statistical artifact?
Session 1	**10:00–10:15**	**Talk 03**	**Ordonez & Olff:** Niches vs. phylogenies: dissecting similarity patterns of species invasions
Session 1	**10:15–10:30**	**Poster slides A**	**Species distribution models** P05/Barbos et al., P16/Tsiripidis et al., P19/Ewald, P20/Falk et al., P26/Grüters, P44/Pellowski et al., P47/Richter & Münzbergová, P50/Rupprecht et al., P52/Schmidt et al., P58/Tene Kwetche Sop et al., P62/Warmelink et al., P63/Wesuls et al.
	10:30–11:15		**Coffee break & Poster session A (Species distribution models)**
Session 2	**11:15–11:30**	**Talk 04**	**Willner et al.:** Habitat distribution modelling and estimation of range filling of alpine species using a combination of phytosociological and floristic data
Session 2	**11:30–11:45**	**Talk 05**	**Reger et al.:** Using vegetation databases to find the best model for effective thermal climate for the Bavarian Alps
Session 2	**11:45–12:00**	**Talk 06**	**Mellert et al.:** Niche models for tree species in the Bavarian Alps
Session 2	**12:00–12:15**	**Talk 07**	**Boulangeat et al.:** Patterns of plant specialization in the Alps
Session 2	**12:15–12:30**	**Talk 08**	**Jaeschke et al.:** Modelling impacts of climate change on Natura 2000 habitats – an approach for nature conservation
Session 2	**Topic: Vegetation databases worldwide**		
Session 2	**12.30–12.50**	**Poster slides B**	**Vegetation databases worldwide** **Africa:** P17/Dorendorf et al., P18/Dreber et al., P37/Luther–Mosebach et al., P57/Strohbach – **Asia/Australia:** P11/Černy & Petrik, P37/Li et al., P41/Naqinezhad et al., P56/Spencer et al., P59/Uğurlu & Işik – **Americas:** P03/Alvarez et al. – **Europe:** P04/Apostolova, P07/Biţă–Nicolae, P08/Biţă–Nicolae et al., P13/Dengler et al., P38/Lysenko et al., P39/Marcenò, P55/Sorokin et al., P60/Solomakha et al., P64/Weyembergh & T'Jollyn
	12.50–13:30		**Lunch break: Option for lunch in the student cafeteria** (parallel: press conference)

Thursday, 25 February 2010 (continued)

Session 3	**14.00–14.45**	**Keynote 02**	**Rutherford et al.:** Development of the South African National Vegetation Database: applications and links to climate change
	14.45–15.00	**Talk 09**	**Schmidt et al.:** The West African vegetation database: incentives for collaborative data pooling
	15:00–15:15	**Talk 10**	**Finckh et al.:** BIOTA biodiversity monitoring transects along climatic gradients – data structures, patterns and processes
	15:15–15:30	**Talk 11**	**Peterson et al.:** The Landscape Fire and Resource Management Planning Tools Project: a nationally consistent, integrated, and comprehensive vegetation database for the United States
	15:30–15:45	**Talk 12**	**Schmiedel et al.:** Patterns of vascular plant diversity along the BIOTA Southern Africa transect
	Topic: Traits, diversity and informatics		
	15:45–16:05	**Poster slides C**	**Traits, diversity and informatics** **Traits:** P23/Gachet et al., P34/Keser et al., P51/Saatkamp et al. – **Diversity:** P02/Akbarlou et al., P14/Dengler et al., P15/Dengler & Oldeland, P27/Jürgens et al., P42/Finckh et al., P45/Peters et al., P47/Prati et al. – **Informatics:** P21/Muche et al., P22/Muche et al., P30/Hillmann et al., P32/Jansen & Dengler, P35/Kleikamp, P43/Oldeland et al., P53/Muche et al.
	16:05–16:45		**Coffee break & Poster session C (Traits, diversity and informatics)**
Session 4	**16:45–17:00**	**Talk 13**	**Rocchini et al.:** Bayesian theory applied to landscape genetics: testing spatial autocorrelation of genetic similarity by a Markov Chain Monte Carlo test
	17:00–17:15	**Talk 14**	**De Cáceres et al.:** Veg–X – An exchange standard for plot–based vegetation databases
	17:15–17:30	**Talk 15**	**Albert et al.:** Intraspecific functional variability: how should we use traits data from large databases?
	17:30–17:45	**Talk 16**	**Traiser & Mosbrugger:** Leaf traits of woody plants and their significance as environmental proxies
	17:45–18:00	**Talk 17**	**Römermann et al.:** Abiotic and biotic parameters determine phenological responses of tree species to climate change
	18:00–18:15	**Talk 18**	**Lopez Gonzalez et al.:** Forest Plots Database: a global online tool to manage and analyse forest inventory data
	18:15–19:30		**Space for optional meetings**
	19:30		**Conference dinner (Student cafeteria)**

Friday, 26 February 2010

Session 5	**Topic: Detecting and forecasting change**		
	08:30–09:15	**Keynote 03**	**Kühn:** Analysing the impacts of climate change by using large–scale mapping databases
	09:15–09:30	**Talk 19**	**Porcher et al.:** Standardized systematic plant monitoring programs, a needed step for global change research: case study of the French monitoring program Vigie–flore
	09:30–09:45	**Talk 20**	**Gallien & Thuiller:** A new hierarchical framework to model invasive species distribution
	09:45–10:00	**Talk 21**	**Pagel & Schurr:** Forecasting species range shifts with process–based models: what data do we need?
	10:00–10:20	**Poster slides D**	**Detecting and forecasting change** P01/Akasbi et al., P06/Bernhard–Römermann et al., P09/Bourke et al., P10/Coll et al., P12/Czúcz et al., P24/Gervasoni et al., P25/Gottfried et al., P28/Hanke et al., P29/Heinrichs et al., P31/Horchler et al., P33/Kazanis, P40/Marinšek & Carni, P48/Rixen et al., P49/Wipf et al., P54/Schmiedel et al., E2P61/Voß et al., P65/Wu & Hsieh
	10:20–11:00		**Coffee break & Poster session D (Detecting & forecasting change)**
Session 6	**11:00–11:15**	**Talk 22**	**Lenoir et al.:** Pleistocene climate change legacies on current species diversity in European montane plant communities
	11:15–11:30	**Talk 23**	**Janssen et al.:** Changes in the floristic composition of plant communities in relation to climate change
	11:30–11:45	**Talk 24**	**Bodin et al.:** Detection of vegetation shifts in forests of the Southern Alps based on French National Forest Inventory data
	11:45–12:00	**Talk 25**	**Rixen et al.:** The interacting effects of landuse change, climate change and suppression of natural disturbances on forest landscape patterns in the Swiss Alps
	12:00–12:15	**Announcements**	**Dengler et al.:** (i) Prizes for best contributions by young investigators; (ii) World Metadatabase on Vegetation Databases; (iii) Special Volume of *Biodiversity & Ecology* ; (iv) Special Feature in *Applied Vegetation Science*
	12:15–13:00	**Conclusions**	**Ewald**
	13:00–14:00		**Lunch break: Option for lunch in the student cafeteria**

Friday, 26 February 2010 (continued)

Workshops

14:00–16:00	Workshop 3 (R I) & Workshop 4 (R II)
16:00–16:20	Coffee break
16:20–18:30	Workshop 3 (R I) & Workshop 4 (R II)
18:30–19:30	Space for optional meetings
19:30	Option for joint dinner in restaurant (Knips in Klein Flottbek)

Saturday, 27 February 2010

Workshops

09:00–11:00	Workshop 4 (R II) & Workshop 5 (SE European database)
11:00–11:20	Coffee break
11:20–13:00	Workshop 4 (R II) & Workshop 5 (SE European database)
13:00–14:00	Lunch break: snacks will be offered in the venue
14:00–16:00	Workshop 5 (SE European database)
16:00–16:20	Coffee break
16:20–18:30	Workshop 5 (SE European database)
19:00	Option for joint dinner in a restaurant (NN)

Sunday, 28 February 2010

Workshops

10:00–11:00	Workshop 5 (SE European database)
11:00–11:20	Coffee break
11:20–13:00	Workshop 5 (SE European database)
13:00–14:00	Lunch break: snacks will be offered in the venue
14:00–19:00	Option for joint sightseeing in Hamburg
19:00	Option for joint dinner in a restaurant (NN)

Monday, 1 March 2010

Workshops

10:00–11:00	Workshop 5 (SE European database)
11:00–11:20	Coffee break
11:20–13:00	Workshop 5 (SE European database)
13:00–14:00	Lunch break: Option for lunch in the student cafeteria
14:00–16:00	Workshop 5 (SE European database)
16:00–16:20	Coffee break
16:20–18:00	Workshop 5 (SE European database)

Vegetation databases and climate change – conceptual and theoretical aspects in forecasting future species responses

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Species distribution models are often used to assess potential future spatial patterns of individual species or of the diversity of species groups under changed climate or land use. A huge literature has amassed and there seems to be common sense on how such models are developed and projections are generated. The approach is simple but powerful and the statistical and technical development has asymptoted out, yet the approach requires a series of assumptions around the niche of the species modeled. We review these assumptions and discuss to what degree they require attention when either modeling species distributions in space and time or when calibrating niche characteristics for phylogenetic analyses. In the talk we first briefly review the method and give some results on expected climate change effects with few examples. The talk then focuses on three core aspects related to the characterization of the niche, namely (1) what constitutes a niche parameter and how should it be measured, (2) the relationship between the realized and the fundamental niche and its links with the ecological gradients available within a species' range, and finally (3) how design influence the assessment of niche parameters. From these discussions, we conclude with some key points that require attention when studying potential climate change effects or when calibrating nicheparameters for phylogenetics studies.

Development of the South African National Vegetation Database: applications and links to climate change

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Development of databases of broad scale, spatially explicit, field-observed data in developing countries is often challenging for numerous reasons. Although specimen data of the National Herbarium (PRE) in South Africa were computerized in the 1970s, the South African National Vegetation Database (NVD) was founded only in 1997. This also followed the computerization of the extensive species lists, the life's work of John Acocks, in the early 1990's and referred to as ACKDAT. The NVD contains relevé data from the earliest works of around 1970 to the most recent in the country. Both geo-referenced and non-georeferenced relevé data are included and stored in the database management program Turboveg. Geographic coverage is very uneven, with huge gaps in some of the arid areas. There are in excess of 45 000 relevés, 11 500 taxa giving nearly a million records. Number of relevés available for different types of application vary greatly. We show how the database may be used for various types of analysis. These include:

- Determination of patterns of plant species richness along a major climatic gradient and how these are compromised by great local spatial variation and inconsistent plot sizes;
- Relationship between local and regional species richness and their covariation with habitat heterogeneity;
- Species range limits and abundance gradients;
- Species evenness and the distinct drawbacks imposed by limitations of the database;
- Species interactions and species isolation with exploration of subcontinental-wide disassociations between a range of plants and a very common graminoid species tolerant of a wide range of soil types.;
- Modelling the impact of projected climate change based on the different data bases, namely, the NVD and ACKDAT. The NVD can be particularly useful when employed in conjunction with other vegetation sampling databases. Maxent, a maximum entropy method with emphasis on probabilistic reasoning, was used for modelling the climate change responses.

The future of collecting relevé data, especially in the seriously undersampled regions of South Africa, will require a revitalization of local training in and application of systematic vegetation survey.

Analysing the impacts of climate change by using large-scale mapping databases

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Available databases on species occurrences can provide a huge amount of useful information to analyse changes in the past (based on observations) or projections for the future (based on models). Observations of changes caused by climate change are still rare since (i) past observations were often not systematically recorded, (ii) the temporal resolution is too coarse and changes occurred especially in the past few years and (iii) plant species respond slower than more mobile organisms such as many insects or birds. While reviewing some of the observed changes, the focus of the talk will be on modelled impacts of climate change on species distributions, especially using the floristic mapping database FLORKART for Germany. Furthermore, other pressures like land-use or nitrogen immissions are discussed.

Climatic limitation – searching for key determinants of plant distribution boundaries

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Models describing species geographic distribution based on climatic data are essential for a variety of applications in ecology and conservation especially for predictions under global change. Usually, parameterised large scale - so called 'global' occurrence-environment relationships - provide the basis for modelling. This approach to the prediction of species distributions is well established but there still remain several uncertainties and obstacles (Dormann, 2007). Here we are introducing a regionalized approach to account for potential intraspecific phylogeographic structure and regionally varying relationships. The necessity of systematic comparisons of alternative methods in modelling species distribution is generally accepted (Thuiller et al. 2003, Segurado & Araújo, 2004, Elith et al., 2006, Araújo & New, 2007). Thus, for our analysis, we compare different statistical methods and approaches to investigate the relative impact of climatic variables at regionalized distribution limits of woody species.

We find and extract climatically homogeneous sections of species' distribution limits by using a cluster analysis method. Based on the Ward´s-algorithm (Ward, 1963) we determinate optimized spatial partitioning structures along the range boundary of each species. As a result we obtain species specific cluster patterns depending on the climatic structure. These homogeneous climatic border sections serve as regional modelling areas that are supposed to give clearer results than the hitherto applied global approaches (Osborne & Suárez-Seoane, 2002).

In a further step we try to identify the most important climatic variable(s) which might be regarded as potential key determinants for presence vs. absence at the identified homogeneous climatic border sections. We compare the results and general applicability for identifying the most important variables of MAXENT, Hierarchical Partitioning, Classification Tree Analysis (CTA), Logistic Regression and Discriminant Analysis. The future aim is to generate precise and testable ecological hypotheses for experimental analyses.

Evaluating environmental niches across space and time: biological signal or statistical artifact?

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Concerns over global change have increased interest in quantifying the environmental niches of species and, in particular, how niches change across space and time. However, variation among statistical methods used to quantify niches and the differing assumptions underlying these methods have led to ambiguity in interpretations of the real magnitude of niche differences among species. We currently lack a statistical and theoretical basis for choosing among existing methods to quantify niche differences, making it difficult to evaluate which methods consistently produce reliable results. We discuss a systemic evaluation of existing techniques used to quantify niches and present a new statistical framework that quantifies and compares niches in a gridded environmental space. Our method is robust to known and previously undocumented biases related to the dependence of species occurrences on the frequency of environmental conditions that occur across geographic space. We evaluate within this framework several ordination and species distribution modeling (SDM) methods for measuring niche overlap between two species. To fully document uncertainty and statistical bias, we perform this evaluation using simulated species with predefined distributions and known amounts of niche overlap. Our results suggest that ordination and SDM approaches strongly differ in their ability to detect and accurately quantify niche differences and that failure to account for differences in occurrence density and climate availability leads to systematic bias in measurements of niche overlap. Among the most important factors explaining these differences are how the environment varies in relation to species occurrences versus the study region as a whole and how techniques select variables based on this variation. Of the techniques we considered a Principal Component Analysis that summarizes the entire range of climatic variability found in the study area and which projects occurrences of the species in this multivariate space provided the best results. This method is less prone to artificially maximizing differences between distributions of the species that are not ecologically relevant. More broadly, testing for changes in environmental niches is primary to assessing how successfully SDMs can be transferred from one region or time to another.

Niches vs. phylogenies: dissecting similarity patterns of species invasions

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The idea that alien species with close indigenous relatives in the introduced range may have reduced chances of success (Darwin`s naturalization hypothesis) has a long history in ecology, and overlaps conceptually with modern ideas of niche theory and phylogenetic structuring of community organization. Bringing together a leaf, height and seed traits data database spanning 6929 species (5505 species measured in the native and 1219 in the introduced and 205 in both ranges) co--occurring over 364 sites, we evaluated how successful introductions are influenced by scale, niche overlap, niche overlap and phylogenetic relatedness. We show how the level of niche similarity increased with both increased scale and phylogenetic relatedness. This pattern was consistent across plant habits, growth forms and habitats. This might indicate how closely related species may share traits that pre--adapt them to the new environment, or may increase mutualistic or facilitative interactions. Last, the use of both niche overlap and phylogenetic relatedness of an alien to the native community is discussed as a possible predictive tool for screening introduced species.

Habitat distribution modelling and estimation of range filling of alpine species using a combination of phytosociological and floristic data

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There is increasing awareness that many plant species are not in equilibrium with their current environment. Dispersal limitations, operating across various temporal and spatial scales, have been invoked as an important source of such disequilibrium. A promising approach to examine dispersal limitations is to calculate the extent to which a species fills its potential range as predicted by habitat distribution models which are based on the assumption that species are in equilibrium with current environmental conditions. In this study, we focus on 180 plant species having an optimum in the alpine belt of the Alps.

Most habitat distribution models are based on floristic data using grid sizes of many square kilometres. In mountainous areas like the Alps, however, the environmental conditions within one grid cell are extremely heterogeneous. Thus, distribution models derived from these data are not very reliable and tend to overestimate the environmental amplitude of species. We tried to overcome this limitation by using species presence data available from a phytosociological database which contains several thousand relevés of alpine vegetation. Only for a small amount of relevés, accurate geographic coordinates are available. Most relevés are spatially represented by GIS polygons which have been derived from the source literature manually. Polygon sizes vary from a few hectares to several square kilometres. By intersecting these polygons with altitude and aspect (data which are available for almost all relevés) using a digital elevation model, the spatial accuracy of plot locations could be considerably increased. Site variables for the distribution modelling were derived either directly from the database or by map-overlay of the polygons with GIS-layers.

Quantification of range filling was done by comparing the modelled distribution with data of the floristic inventory of Austria. Therefore, modelling of the potential range and quantification of the actual range filling was based on two independent data sets, using their respective strengths (high spatial resolution versus complete coverage of the study area).

Using vegetation databases to find the best model for effective thermal climate for the Bavarian Alps

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Information on the effective thermal climate is an important environmental factor for modelling e.g. the distribution of mountain forest types. Within the INTERREG IVA project “Forest Information System for the Northern Alps” (www.winalp.info) we aimed at finding the best model for effective thermal climate for the Bavarian Alps. We analysed simple thermal models that were derived from a digital elevation model and/or climate data. The investigated models were elevation above sea level (ELEV), mean annual temperature (TYR), mean temperature in January (T01), mean temperature in the vegetation period (T59), growing degree days above 5 °C (G05), growing degree days above 10 °C (G10), and first principal component (PC1) representing a linear combination of monthly precipitation, temperature and growing degree days. In order to find the best simple thermal model, we correlated each model result with average Ellenberg indicator values for temperature (mT), which were derived from 2280 relevés of the phytosociological databank BERGWALD. Statistical analyses showed that correlation coefficients were highest for unweighted mT based on vascular plants with a decreasing correlation from G10 (Spearman's r_s = 0.7289), T59 (0.7282), G05 (0.7255), TYR (0.7184), ELEV (-0.7063), PC1 (-0.6454) to T01 (0.5485). Subsequently, we tested if simple thermal models may be improved by slope aspect and inclination correction (CAI) or global solar radiation correction (CR). Statistical analyses showed that all simple thermal models were less correlated with unweighted mT based on vascular plants than simple models corrected by CAI and CR. Resulting from these analyses we examined combinations of the best relief (ELEV) and climate variables (G10, G05, T59) and the correction variables (CAI and CR) by using linear regressions. Results showed that unweighted mT based on vascular plants is best predicted by the combination of the climate variable T59 and the relief correction variable CAI (R^2 = 0.56; Spearman's r_s = 0.7466). The identified best model for effective thermal climate will be integrated in a GIS and used for vegetation modelling.

Niche models for tree species in the Bavarian Alps

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The EU-Project INTERREG IVA “Forest Information System for the Northern Alps” (WINALP) is establishing a GIS-based expert system for the site-specific management of forests in the Northern Alps at a scale of 1:25,000. Species distribution models based on coarse distribution data do not well reflect thermal limits in high mountains. To obtain information on tree species suitability, we established habitat models for the 14 most common tree species of the region. For this purpose we merged forest inventory data and the phytosociological database BERGWALD and combined tree species occurrence data with environmental data derived from a digital elevation model, climate and soil maps, resulting in a database of about 50,000 oberservation sites across the entire study area of about 4,600 km². A central question in our approach was whether models based on expert knowledge and data-driven models converge. This was examined in a parsimonious modelling approach involving a hierachical division of main effects and interactions using Generalised Additive Models (GAM) and conditional inference trees. We adapted our basic models to account for problems resulting from imprecise georeference of data, spatial autocorrelation and uneven coverage of niche space and environmental gradients.

Conceptual models were generally in accordance with expectations, though explained deviance of basic models ranged only from 0,02 to 0,49 (median = 0,09). Variables based on average temperatures were the most important predictors in most models. Proxies for soil properties such as water and nutrition availability were statistically significant and generally plausible, but appeared to be largely redundant for model performance. Most species responded differently to summer and January temperatures, indicating that temperature variables are proxies for energy balance, frost damage and drought at the same time. Models confirmed preference for limestone soils for only three out of five calcicolous tree species. In accordance with expert knowledge, *Sorbus aria* and *Fraxinus excelsior* showed stronger affinities to soils with high base saturation than *Acer pseudoplatanus*. Our results show that meaningful habitat models can be obtained from noisy data sets covering only a small fraction of species ranges. On the other hand, it is clear that the limitations of such regional models require combination with information from other regions as well as with coarser models covering entire species ranges.

Patterns of plant specialization in the Alps

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Specialist species, i.e. species that thrive only in a limited range of environmental conditions or use a limited set of resources, are often even considered to be the "great losers" of past and current global changes, and trends in the abundance of these species are used as indicators of unsustainable development. Similarly, communities harboring a substantial number of specialists could be seen as remarkable both in terms of conservation but also in term of ecosystem functioning.

Here we present a macroecological study that investigates patterns of plant specialization in the French Alps. More than having a general overview of the specialization in the French Alps, we try to understand what makes a plant specialist, and to discriminate the communities containing the highest diversity in specialists. To address these objectives, we used an extensive dataset of 4089 plant communities containing overall 1600 species, spreading over more than 30,000 km² in the whole French Alps.

For 400 of these species that have been recorded in at least 20 communities, we used specialization similar to Fridley theta (2007). This index is particularly interesting because it relies only on species co-occurrence and makes no hypothesis about the environmental factors controlling species distributions. Using this method we show that plant species in the French Alps exhibit a large variation in specialization, which can be explained by some traits or strategies. The type of communities containing a large number of specialists also showed interesting patterns supporting the conservation interest of some particular habitats.

Modelling impacts of climate change on Natura 2000 habitats – an approach for nature conservation

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Recent climate change influences animals and plants as well as whole ecosystems. Projected future climate will lead to range shifts, not only of single species, but also of whole habitats. These shifts are one of the major challenges for nature conservation and demand appropriate approaches. One of these approaches is the modelling of future distributions.

The modelling of climate change impacts on habitats, listed in Annex I of the European Habitats Directive, is one part of the project “Impacts of climate change on fauna, flora and habitats as well as adaptation strategies of nature conservation", which is funded by the Federal Agency for Nature Conservation (BfN). Based on vegetation databases and data from Articel 17 Reports (EU Habitats Directive) we model the current and future distribution of selected Natura 2000 habitats in Germany and Europe.

In our approach, we use Species Distribution Models (SDMs) with different types of modelling algorithms. We aim to integrate a broad range of reasonable predictors like different climate variables, land use, dispersal ability, soil variables and biotic interactions.

Here, we present preliminary results of modelled impacts on natural habitat types of community interest in Europe based on the following research questions:

1. How does climate change influence the future distribution of habitats?
2. Which habitats will lose and which will win? Will new habitats arrive in Germany that are currently not yet here?
3. What are possible adaptation strategies for nature conservation?

The West African vegetation database: incentives for collaborative data pooling

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Research on conservation and sustainable management of natural resources in West Africa depends on the availability of species occurrence data with good spatio-temporal coverage. Observation data is especially important in this context, because it is widely available in African research institutions and can complement rare species bias in collections-based data. Observation data is, however, often unpublished and frequently not archived at an institutional level. A database providing researchers with an overview of existing observation data is highly desirable, because it will help to avoid redundant data collection, promote the closure of data gaps and create research synergies. In order to provide incentives for data contribution, such a database must be perceived by researchers and institutions as a user-friendly tool perfectly integrating with their work flow. It must address data property rights concerns, allow researchers to work offline as well as online and provide added value for data management.

Here, we present the West African Vegetation Database, an online database that has been developed in the course of the BIOTA and SUN projects. It stores relevé data, i.e. lists of species observed on a given surface at a given time facultatively including cover and dendrometric data. The online database synchronizes with the MS Access data entry and query tool VegDa 3.0 (offline), includes a data property rights management system and offers the advantages of data security, standardisation as wells as powerful search and sharing functions. Public occurrence data in the database are linked to GBIF. Recent digitization efforts of the partner institutions have created large datasets that can be searched at www.westafricanvegetation.senckenberg.de and the database is open to contributions by all scientists wishing to use and strengthen this collaborative platform.

BIOTA biodiversity monitoring transects along climatic gradients - data structures, patterns and processes

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Nine years of observation data are available from the BIOTA biodiversity monitoring transects in Southern Africa and Morocco. We will present data structures of the resulting transect and observatory data sets. Special focus will be given to population based plot data from southern Morocco. Furthermore, problems of time series data, the structure of individual based population data, and associated functional trait and life form information will be discussed.

Plant abundances and individual densities along the aridity gradient in southern Morocco are analysed. Assessments are based on population censuses and measurements at individual level. Relative abundances of different life forms along the transect are compared with the results of traditional life form spectra based on species numbers.

Shifts in species composition and differences in abundance between grazed and excluded plots over time are used as indicators for the intensity of degradation due to current land use intensities. With increasing aridity, we find decreasing differences in species abundances. At arid test sites below the 100-mm isohyet, abundances fluctuate according to annual precipitation pattern but do not show any significant differences between fenced and grazed plots.

Using the difference between exclosed and grazed plots as a degradation measure, we can conclude that semi-arid ecosystems in southern Morocco are more prone to desertification than arid ecosystems. Finally, we discuss the underlying ecological processes and their consequences for sustainable land management and future monitoring approaches.

The Landscape Fire and Resource Management Planning Tools Project: a nationally consistent, integrated, and comprehensive vegetation database for the United States

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LANDFIRE is a multi-partner program producing consistent, integrated, and comprehensive geospatial data and models describing vegetation, fuel for wildland fires, and historical fire regimes across the United States. It is a shared program between the wildland fire management programs of the U.S. Department of Agriculture Forest Service and U.S. Department of the Interior. LANDFIRE applies consistent methodologies to develop comprehensive and integrated data products across the United States for both natural resource and fire management organizations. In September 2009, LANDFIRE delivered the last of 24 data products at a 30-m resolution for all lands in the United States. Currently, the program is in transition from the initial development and production phase into an ongoing program of vegetation and fuel data product improvement and updating, application development, and enhanced data distribution. For detailed information about LANDFIRE data products, documentation, and program status please see http://www.landfire.gov.

LANDFIRE forms a foundational database for the LandCarbon program. LandCarbon is a program, mandated by Energy Independence and Security Act of 2007 to develop a methodology for quantifying carbon stocks and sequestration and forecasting carbon storage capacity under a portfolio of policy, management, and climate change scenarios. LANDFIRE vegetation and wildland fuel data are used as input to a modeling system that predicts the number and size of wildland fires in relation to climate, land-use/land-cover change, and socioeconomic variables 50 years into the future.

Wildland fire and landscape managers use LANDFIRE data products to predict the affects of vegetation management on fire behavior, to plan for hazardous fuel reduction projects, to support tactical and strategic fire planning; to support resource management activities such as vegetation management and habitat assessment; and to support national-level carbon assessments for the united States. The comprehensive, consistent, and automated methods developed through the LANDFIRE project complement an integrated approach to wildland fire management and facilitate comparison of potential treatment areas using equivalent databases across the entire United States.

Patterns of vascular plant diversity along the BIOTA Southern Africa transect

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The vascular plant botanists in BIOTA Southern Africa assessed and annually revisited about 30 BIOTA Biodiversity Observatories which are located along the major rainfall gradients between the Cape Point in south-western South Africa and the Kavango in northern Namibia. By employing the BIOTA AFRICA standards in plot sizes, layout and methodology, we analyse - for the first time for this subcontinent - patterns of vascular plant diversity for the major arid and semi-arid biomes of southern Africa. Plant species richness on 100 m² and 1000 m² plots, and their *z*-values as expression of its species-area relationship are compared for the BIOTA Observatories along the rainfall gradient, covering both, winter and summer rainfall regime. The analyses revealed for instance, that the species richness of the arid Succulent Karoo with less than 150 mm annual winter rainfall by far exceed the species richness of the Nama Karoo with the same annual amount of summer rainfall. The patterns will be interpreted against the main environmental drivers like climate, pedodiversity and landuse.

Bayesian theory applied to landscape genetics: testing spatial autocorrelation of genetic similarity by a Markov Chain Monte Carlo test

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Recent seminal papers have introduced landscape genetics as a new discipline incorporating landscape ecology and genetic diversity. As an example, genetic diversity between or within species (e.g. genetic similarity between populations) can be mapped across a landscape by relying on network theory.

In this view, frequentist inference can be used to estimate the probability of occurrence of certain patterns in the data Y given a particular hypothesis H (P(Y/H)). Instead, Bayesian inference provides a quantitative measure of the probability of a hypothesis being true in light of the available data (P(H/Y)).

Several computer programs implement Bayesian approaches to spatial genetic structuring. Each implementation, however, rely on slightly different assumptions. To test the consistency among analyses produced by using different programs and to compare the peculiar weaknesses or strengths of each implementation, we compared different Bayesian methods of analysis to spatially represent the autocorrelation of genetic similarity of Melampyrum sylvaticum, an understory hemiparasitic plant species, in a highly structured mountain landscape corresponding the the Trentino region in Eastern Alps (Northern Italy).

The spatial patterns of genetic structuring identified by means of the computer programs Structure and Geneland were compared. In particular, the use of Markov Chain Monte Carlo (MCMC) tests for simulating potential subpopulation scenarios will be discussed in detail.

Veg-X – An exchange standard for plot-based vegetation databases

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Worldwide there are many groups engaged in structured community vegetation studies that collect and store very similar data. However, in most cases this information is not easy to share or gather. This limits collaborative research initiatives and global synthetic vegetation analysis, such as identifying and predicting vegetation changes following the current trends of global change. The primary impediments to large-scale sharing of vegetation data are (1) the lack of a recognized international vegetation data exchange standard and (2) the panoply of tools and database implementations that exist among institutions participating in community vegetation research. Development of an exchange standard was endorsed at the first IAVS Ecoinformatics Working Group meeting in 2003, and the Governing Council of IAVS invited us to develop a standard for approval and endorsement by IAVS. Subsequently, two workshops were held to discuss and develop a plot-based vegetation data exchange standard schema (April 2007, June 2008, at National Evolutionary Synthesis Center (NESCent) in Durham, NC). The first workshop, with 12 participants from 6 countries, formulated a common set of goals, concepts, and terminology for plot-based vegetation data. At the second workshop, this ontology was developed into a draft XML schema representation that is maximally compatible with existing standards (e.g., Darwin Core v.2 and Taxon Concepts Schema) for consideration by the broader community. The draft exchange standard for plot-based vegetation data (Veg-X) allows for observations of vegetation at both the individual specimen and aggregated organism levels, ensures that observations are fixed to physical sample plots at specific points in time, makes a distinction between the entity of interest (e.g., an individual tree) and the observation act (i.e., a measuring event applied to it), has the ability to group observations of entities following pre-defined or user-defined criteria, and ensures that the connection between the entity observed and taxonomic concept associated with that observation are maintained. Exchange standards, such as Veg-X, followed by the development of ecoinformatic and analytical tools, will allow scientists to use many more plots in order to perform analysis and predictions of vegetation changes at local and global scales. The Veg-X draft exchange standard can be viewed and discussed via its Wiki at http://wiki.tdwg.org/twiki/bin/view/Vegetation/WebHome.

Intraspecific functional variability: how should we use traits data from large databases?

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Functional traits are increasingly collected and used to answer various ecological questions: understand plant adaptations; investigate community structure and ecosystem functioning; classify species into functional groups and define functional strategies; predict vegetation dynamics and biochemical cycles. In addition, traits data are now collected and stored in large databases (e.g. TRY, LEDA) that mostly proposed mean trait values (and sometime associated variance) per species. However the crucial hypothesis on which relies the use of functional traits, i.e. that functional traits should be more variable between than within species, has rarely been empirically tested. Functional traits are yet expected to be variable between and within species. Moreover the intraspecific functional variability, which results from local adaptations and phenotypic plasticity, is supposed to influence and modulate species responses to environmental changes and their effects on their environment but remains poorly known.

Within this study, using an appropriate stratified sampling strategy within a French alpine valley, we collected traits data from 16 common species with contrasted life histories to: (1) quantify the intraspecific functional variability for a selection of plant species; (2) describe the link between intraspecific variability and climatic gradients; (3) disentangle the relative importance and structure of intra vs. interspecific functional variability; and (4) test the influence of accounting for intraspecific variability when estimating functional diversity indices (e.g. Rao's quadratic entropy) for forty alpine grassland communities.

The measured intraspecific variability turned out to be large and mostly due to environmental effects and individual differences. Exploring multivariate traits patterns showed that intraspecific variability does not modify species strategy definition but that intraspecific variability was not negligible. Finally including intraspecific variability in the calculation of Rao's diversity index showed that this variability and its structure play a major role and should not be systematically neglected. From these results we conclude that (1) databases have to contain information on traits variability and on the environmental conditions in which measurements have been done; (2) one has to distinguish between large scale study with very contrasted species and regional studies were traits have to be measured locally; (3) combining the use of databases data and studies quantifying intraspecific variability can lead to realistic simulations that can be used as surrogates of exhaustive traits measurements.

Leaf traits of woody plants and their significance as environmental proxies

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Leaf traits in particular leaf physiognomic characters of woody Angiosperms are used since long in palaeobotany as environmental indicators. At this, leaf traits from different species are described by using various physiognomic characters such as leaf size, - shape, - geometry, - organisation and leaf margin features. These leaf physiognomic characters are subsequently correlated with different environmental data.

Within the open source ELPA data set (European Leaf Physiognomic Approach; http://doi.pangaea.de/10.1594/PANGAEA.552352) the leaf physiognomic composition of the extant European lowland vegetation is calculated on the basis of 108 hardwood trees and shrubs, which represent the most common taxa in Europe. In order to investigate spatial correlations between leaf physiognomic composition of the vegetation and environmental conditions different climatic and ecological parameters were compiled.

The general spatial patterns of some leaf physiognomic traits show clear latitudinal gradients. For example the leaf form (length-to-width ratio) and leaf geometry of the vegetation change as a function of latitude. Furthermore, there is a clear trend of increasing proportion of taxa with toothed leaf margins with increasing latitude. Different transfer functions are calculated in order to reconstruct climatic and ecological parameters on the basis of leaf physiognomy. Overall, climatic predictions based on transfer functions of temperature related parameters such as mean annual temperature or growing season length show high reliability whereas precipitation related parameters are predicted rather insufficiently. Due to the fact that there are clear spatial patters in leaf physiognomic composition of the vegetation leaf traits are also suitable to classify vegetation. For instance leaf physiognomic composition of Scandinavian and Mediterranean vegetation is clear distinct forming separate "leaf physiognomic plant communities". Contrary to the traditional concept of vegetation classification, which is based on the actual taxonomic composition of plant communities leaf traits offer the possibility to define timeless leaf physiognomic communities independent of taxonomic composition. This approach is of interest particularly with regard to modelling non-actualistic environments of polar broad-leaved forests of the Paleogene and also possible future environments in high latitudes.

Abiotic and biotic parameters determine phenological responses of tree species to climate change

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Climate change has been shown to strongly effect species distributions and performances. Different (meta-) analyses have shown that species adapt to changes by e.g. prolonging their life-cycle. This can be observed for example in tree species which today show an earlier bud burst and a delayed fall of leaves compared to the 1950s to 1970s. It is, however, not clear whether these shifts in single phenological stages lead to an increase in overall growing season length, or whether the growing season just shifts to earlier or later days in the year. Furthermore, we do not know whether species react similarly to climate change in different regions or whether this reaction depends on site characteristics or species or individual performances.

In the current study we aim to shed light on these unsolved questions by analysing large-scale long-term phenological data from six selected tree species recorded by the German Meteorological Service. In addition we carried out a detailed field study at 10 different sites to measure two selected performance parameters for exactly those individuals which have been monitored during the last 60 years: photosynthetic capacity (Vcmax: maximal carboxylation rate deduced from A-Ci curves) and specific leaf area as a surrogate for growth rate.

The results clearly showed that the growing season lengths have been increased during the last 60 years for all selected tree species; this increase was positively related to increases in temperature. The rate of increase, however, differed with species and site characteristics. It was at least partly possible to explain these differences by the measured performance parameters: the higher the photosynthetic capacity of a species, the higher was the increase in growing season length during the last 60 years.

From this study we can conclude that the phenological responses of species are largely related to their eco-physiological properties. Species with higher photosynthetic capacities profit more from increases in the thermal vegetation period by extending their growing season and may be hence the winners in the context of climate change.

Forest Plots Database: a global online tool to manage and analyse forest inventory data

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The Forest Plots Database (www.forestplots.net) is a web-accessible secure repository for forest plot inventories. The database was designed to store plot geographical information, location, taxonomic information and diameter measurements of trees >10 cm inside each plot. Information on participants in plot establishment and re-measurement is also included.

Database users can, depending on the security level granted, can view, edit , upload and download plot information. The database includes a query library which allows users to view and download biomass, basal area, wood productivity and plot geographical information.

Standardized systematic plant monitoring programs, a needed step for global change research: case study of the French monitoring program Vigie-flore

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To document actual climate-driven changes in plant communities, data collection should go beyond mere presence/absence, and inform on the abundance of plant species. However, most plant data collated in existing databases were collected using contrasting methodologies, a source of substantial variation and even biases. As a result, such data are generally not reliable to document changes in species abundance and there is a need for long-term plant monitoring programs using standardized protocols and informing on species abundance.

Here, we present a nationwide standardized plant monitoring program that was recently launched in France, Vigie-flore. This monitoring program is based on annual exhaustive surveys of systematically sampled 10 m² plots. Local species abundance is estimated via frequency of occurrence within 10 m². We show that such standardized data are much more appropriate to document the effects of habitat change on the abundance of individual species and on plant community composition. Finally, we discuss their future use to monitor climate-driven changes in plant communities.

A new hierarchical framework to model invasive species distribution

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Today biological invasion is a tremendously concerning issue and because of the expensive cost of management and eradication (when possible), good tools for preventive strategies need to be developed and validated. Traditionally, when modeling invasive species distribution in a screening purpose we use Habitat Suitability Models (HSM), as they are fast and easy to handle. Basically, HSM estimates the suitable environment for a target species (ecological niche) and screens other areas to find out if they show similar conditions (potentially invasible). However, estimating species niche is not an easy task, and recent works have shown some erroneous HSM predictions due to "niche shift" between the native and the invaded range.

In order to overcome the problem, we offer the use of a hierarchical HSM framework. This framework, applied on alpine exogenous plant species, is a three-step process: 1. model globally the target species “fundamental niche” via large-scale distribution and climatic data, 2. introduce intermediate scale land-use and habitat information, and 3. add fine scale information on community structure data. At the end, we compare the outputs of such models for the 100 exogenous species of the French Alps, and look at consistency in the type of data that should be used when estimating areas at risk of invasion.

Forecasting species range shifts with process-based models: what data do we need?

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Current studies projecting range shifts in response to climate change are predominantly based on phenomenological models of potential climate space (climate envelope models). These models neglect spatial population dynamics and assume that species distributions are at equilibrium with climate, both at present and in the future. A more reliable projection of range dynamics under environmental change requires process-based models that can be fitted to distribution data and that permit a more comprehensive assessment of forecast uncertainties. Here, we introduce a Hierarchical Bayesian framework that utilizes models of local population dynamics and regional dispersal to link data on species distribution and abundance to explanatory environmental variables.

To test this approach, we generate dynamics of ´virtual species´ (a grid-based ecological simulation model), which a „virtual ecologist"; observes using different sampling designs. This virtual ecologist then applies Markov chain Monte Carlo techniques to sample from the full posterior distribution of the model parameters to forecast the future geographical distributions and abundances of the species under prescribed climatic changes. We assess the quality of these forecasts for a range of scenarios varying in both the ecological dynamics and the data used for model estimation. While we find that the process-based approach clearly outperforms phenomenological species distribution models for a wide range of ecological dynamics, the comparison of different data scenarios allows us to identify the potential application range of the presented method and to formulate specific demands for the monitoring of biodiversity responses to environmental change.

Pleistocene climate change legacies on current species diversity in European montane plant communities

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Southern Europe was climatically much more stable during the Pleistocene than Northern Europe, which were nearly completely glaciated during glacial maxima. Does this difference in glacial impact affect the present-day and local-scale species diversity of plant communities in the two regions? Due to greater opportunities for re-colonization, local survival during glacial and ongoing cladogenesis, and closeness to the main glacial refuge locations we predict higher local-scale species richness in Southern Europe. We explored this question by analyzing species richness in ecologically well defined and high-quality georeferenced vegetation sample plots of less than 1 km² size in two mountain regions, the Alps in Southern Europe and the Scandes in Northern Europe. We assembled a large amount of vegetation-plot data (more than 30,000 relevés) from Norway, Finland, France, Switzerland and Austria. As species richness may depend on environmental conditions we used Ellenberg indicator values and a multivariate analysis to pair environmentally similar relevés from the two regions to factor out any such effect. Based on the resulting 478 Alps-Scandes pairs, we compared species richness between carefully matched, environmentally characterized relevés with a median surface area of 25 m² per relevé in each region. Species richness was compared as simply the difference in the number of vascular plant species present per relevé in each Alps-Scandes pair. Overall, we found no significant differences in local-scale species richness between environmentally similar relevés in different evolutionary backgrounds, but we did find a significantly greater local-scale species richness in the Alps for the less acid Alps-Scandes pairs. At a finer scale resolution (25 m²) and in the most acid habitats, our results do not lend support to the hypothesis that historical factors such as past climate change and post-glacial re-colonization processes influence local-scale species richness in Europe. However our results suggest historical and evolutionary processes that took place on the less acid soils, widely available during the Quaternary period in both time and space in Europe with a reversed ratio between calcareous and acid habitats for much of the past.

Changes in the floristic composition of plant communities in relation to climate change

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Question: How did species composition change in different plant communities over the period 1930–2010 and what is the relation with climate change?

Location: The Netherlands.

Methods: The National Vegetation Databank was used, containing more than 500,000 relevés of all plant communities in the country, covering the period 1930–2010. Relevés were selected for eight plant communities: two weed communities, two grassland types, two heathland types and two forest types. Based on stratification methods (Haveman & Janssen 2008) for each community random samples of three time periods were selected, resulting in a list of plant species that had increased or decreased significantly. These lists were analyzed using Ellenberg indicator values.

Results: The results show that in the weed communities the largest shift took place from species that prefer relative cold conditions towards species that prefer warmer temperatures. In grassland and heath land communities only slight effects of raising temperatures were indicated by the species composition. In forest communities trends in species composition indicate an average decrease of temperatures.

Conclusions: It is concluded that different plant communities react different on rising temperatures resulting from climate change. Especially open, pioneer communities are vulnerable for an increase of species that profit from warmer conditions. Grasslands, heathlands and forests are more resilient and effects of rising temperature are overruled by changes in hydrology, nutrient status or management.

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Detection of vegetation shifts in forests of the Southern Alps based on French National Forest Inventory data

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National Forest Inventories provide forest vegetation data already repeated several times in some countries. The homogeneity of records in space and time and the adequate sampling schemes ensure a good representativness of forest vegetation. Thus, NFI are a promising source of data for studying the impact of global changes on vegetation dynamics.

Here, we studied the repeated inventory of French forests of the Mediterranean mountains and Southern Alps. From this vegetation database, we calculated the shift in the altitudinal optimum of 175 species over 14 years, based on more than 15000 plots at each inventory. We observed a global upward movement of these species, by 13.6 m per decade. This observation is coherent with the hypothesis of a response to climate warming, although largely lagging behind the expected shift calculated from local climate trends (89 m/decade). Moreover, the ecology of shifting species suggests an impact of forest closure and maturation. We took advantage of additional data collected by NFI about stand structure and openness and separated the initial sample into closed and open forests. The optimum of species calculated in only closed forests displayed no significant shift between the two inventories, reinforcing the conclusion that forest closure and maturation, and not climate change, were the main drivers of the observed species shift. Similarly to what have been observed above the treeline, vegetation shifts during the last decades in forest biomes were strongly controlled by land-use changes. Such effects of land-use change, which act at large geographical scales, should not be confounded with climate change effects.

The interacting effects of landuse change, climate change and suppression of natural disturbances on forest landscape patterns in the Swiss Alps

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Ecosystems are being modified by a multiplicity of interacting anthropogenic factors. The most important of these factors includes changes in landuse, changes in climate, and alterations of disturbance regimes. Many studies have considered these factors separately; however, these factors do not act in isolation, but rather interact with one another to affect ecosystem structure and function. In the present study, we considered how the interacting effects of changes in landuse (away from agricultural uses), climate (growing degree days), and the avalanche regime have altered landscape patterns of forest vegetation in the Davos region of the Swiss Alps over the past 45 years. Our findings are based on GIS analysis of data interpreted from aerial photographs and documentary and instrumental records. In univariate analysis, changes in landuse, climate, and disturbance each had a detectable influence on forest structure. Changes in landuse was the most important variable contributing to changes in forest structure, followed by changes in the disturbance regime, then changes in growing degree days. There also exist clear interactions among these variables. We discuss these interactions and the relative importance of each factor. It is possible to gain some insight into ecosystem structure and function by studying the effects of individual variables (e.g. landuse change). However, a much more complex and realistic understanding of ecosystem dynamics can be derived from studying the relative importance of and interactions among changes in landuse, climate, and disturbance. We stress the need to understand the relative importance of these factors and their interactions across ecosystems. Doing so will lead to a more complete understanding of ecosystem dynamics and to better management decisions.

Interannual changes of standing biomass in grazed and ungrazed steppes in the Atlas Mountains, southern Morocco

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Overgrazing is an important factor of degradation in arid and semi arid rangelands. In order to quantify the effect of grazing on the vegetation, BIOTA Maroc established in 2001 excloded and grazed permanent plots in a sagebrush steppe at the southern slope of the central High Atlas. The steppe is dominated by the dwarfshrub species *Artemisia herba-alba*, *Artemisia mesatlantica* and *Teucrium mideltense*. We developed a non-destructive method to evaluate standing biomass, using a nonlinear regression between dimensional measures and biomass of individual plants. We found different volume-biomass equations inside and outside of the exclosure due to modifications of shrub densities by browsing. We used the respective equations to calculate the biomasses for the years 2004 to 2009, using monitoring data from the BIOTA Maroc vegetation database. We compared interannual changes in aboveground biomass of the three species between grazed and ungrazed plots. We found significant differences in annual biomass changes between exclosure and grazing conditions for *Artemisia herba-alba*, whereas differences were not significant for *Artemisia mesatlantica*. Concerning *Teucrium mideltense*, the significance varied from year to year. Generally, biomass changes within the exclosure are higher than outside, especially for *Artemisia herba-alba.*

The roles of different utilization methods on species richness of mountain meadows

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Meadows are one of rangelands that their species richness is declining due to the extension of harvesting and overgrazing. These ecosystems are dominated by grasses and no shrubs can grow there. Chaldoran is main places that mountain meadows grow in Iran. Local people use these mountain meadows with different methods that they have different effects on the meadows functions. The objective of this research was to investigate the effect of different utilization on plant species richness. According to utilization methods (moving, grazing and moving - grazing) 3 representative meadows were selected as main study units within which three levels of moisture (low, moderate and high) were also defined 10 quadrats of the size 60 cm ×25 cm were randomly plotted in each study unit and the number of species and their production were recorded. The effects of utilization methods and soil moisture regime on species richness were analyzed using factorial experiment in CRD. Results show that species richness was significantly different in various methods of utilization and in different soil moisture levels ($p < 0.05$). In grazing and moving - grazing methods of utilization, species richness show an increase with the increase of soil moisture but an inverse relation was observed in moving method between species richness and moisture level.

A data bank for ephemeral wetland vegetation in extratropical and orotropical South America

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In contrast to Europe, syntaxonomical vegetation analyses based upon large data sets are rare in South America. We started to create such a data base for seasonal wetlands by storing 514 samples, published in 26 bibliographic sources in Turboveg.

The sampling process and the classification of the data are facing several problems: 1) Floristic nomenclature changes according to national floras and publication date and taxonomical treatment of important diagnostic taxa is outdated, 2) Plot size changes considerably according to authors and vicinismus effects are obvious, 3) The publications are dispersed in journals of national distribution and access is difficult, 4) The description of syntaxa is based until now upon regional or national data sets and syntaxa of higher rank are created hasty, 6) Authors have a strong tendency to describe vegetation types based upon endemic plant species and upon infraspecific taxa, resulting in an atomization of plant communities.

Results of the phytosociological classification of South American ephemeral wetlands will be presented and approaches to overcome some of the mentioned problems will be discussed, for example the down weighting of species of the surrounding matrix vegetation and a classification based upon supra-specific taxa.

Bulgarian phytosociological database

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Bulgaria is relatively small country, but is characterized by significant vegetation diversity. Since the beginning of 20th century the phytosociological studies have been started. Due to some historical and political reasons these studies have been carried out following the dominance approach. Some 3000 relevés collected following this approach are already published and they cover forest and herbaceous communities. The establishment of a national vegetation database started in year 2000, thanks to the Turboveg software provided by S. Hennekens. Currently the database includes over 4000 relevés collected in the last ten years following the methodological principles of the Braun-Blanquet approach. The studied vegetation types are mostly grasslands. Our working group is hard working aiming to computerize all available in the literature releves for Bulgaria as well as all relevés collected during recent projects. A special algorithm for conversion the quantitative estimates from the older literature sources into Braun-Blanquet scale is published. The header data for all records are standardized. The species list is updating continually. A check list for plant communities was prepared and was incorporated in the database. A special tool for visualization the UTM grid distribution was also prepared. Our aim is to stimulate and support the national vegetation survey and to collect information about South-East European vegetation on a larger scale.

Modelling the total and rare plant species richness and abundance of *Nardus*-dominated grasslands in the Romanian Carpathians

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A large data set of floristic relevés performed in the Romanian Carpathians was analysed in order to individuate species-rich acidophilous *Nardus* grasslands, their diagnostic species and the site factors best related to plant species richness for a clearer distinction of the EU priority habitat type 6230 and, to model the total and rare species richness and abundance of all *Nardus*-dominated communities in relation to environmental variables and the relative abundance of various plant functional groups.

Using the quality control approach, we distinguished three groups of relevés (high, medium and poor richness). In the absence of other criteria, the first two groups were assigned to 6230 habitat type.

Total species richness increases monotonically with the increment in soil pH and proportion of legumes, while declining steadily with the augmentation of altitude and *Nardus stricta* relative abundance. An unimodal response of total species number was observed instead with respect to soil nitrogen and, the proportion of palatable herbs and aboveground stoloniferous plants.

The rare species richness and relative abundance are influenced by almost the same environment variables and plant functional groups (excepting the relative abundance of deep-rooted plants and graminoids), but the shape of these relationships is a little different. The most important discordance in the response of total and rare species richness is determined by soil nitrogen, which limits drastically the occurrence of rare plant taxa but support the coexistence of common species.

In addition to the well-known environmental variables related to biodiversity, our results bring forward the importance of grassland guild structure, in terms of plant functional groups partitioning, for the maintenance of high levels of (rare) plant species richness in *Nardus*-dominated communities.

Useful guidelines for objective distinction and rational management of acidophilous species-rich *Nardus* grasslands within the framework of Natura 2000 ecological network can be drawn from the outcome of our analyses. Because not both total and rare species richness can be jointly maximised, the management of these grasslands should be differentiated according to the conservation objectives stated for every particular site.

Explaining grassland biomass production – the importance of biodiversity and climate changes with fertilization and mowing frequency

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Climate and biodiversity are known to influence grassland biomass production, but to date no study quantified their relative importance in relation to different management treatments. This is, though, of principal importance to deduce implications for land-users in the context of global climate change. In the current study, we ask if we can detect differences between management treatments (i) in biomass production, and (ii) in the effects of climate and biodiversity on biomass production. We analyzed changes in biomass production over the last 37 years on a grassland site in North-West Germany, with mowing at five frequencies (once per year to eight times per year), each with and without fertilization. Biomass production and vegetation composition were recorded annually. Biodiversity was included using the presence-absence based indices species and functional richness, and the abundance weighted indices species evenness, functional evenness and functional divergence.

The results showed clearly that nutrient status and management frequency had a strong impact on grassland biomass production. Biomass production was generally enhanced on fertilized plots, and within each fertilization treatment, highest at intermediate mowing frequencies. With an increasing intensity of disturbance we detected for species and functional richness increasing effects on biomass production. Both indices refer to the probability to which optimally functionally adapted species occur in the local species pool. In contrast, species evenness alludes to dominance structures which describe patterns of niche partitioning or interspecific facilitation. These are of principal importance at low management intensities when strong competitors occur. Furthermore, high growth rates of strong competitors are related to temperature, which had an enhanced effect on biomass at low mowing frequencies. However, on the fertilized plots functional divergence increased in importance with increasing mowing frequency, indicating that next to the filters for highly specialized plant species, dominance structures are important. As functional divergence measures the agglomeration of the functional identity of most abundant species, it refers to mechanisms of co-existence.

With reference to the effects of climate and biodiversity on biomass production, we can highlight the importance of the interaction between nutrient status and management frequency when analyzing grassland biomass production.

Vegetation database of dry grasslands in the southeast Romania

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Question: How about vegetation database of dry grasslands in the Southeast Romania?

Location: Southeast Romania.

Methods: We searched for more then 350 papers of the literature of dry grasslands.

Results: There were found about 500 synoptic tables included classes *Koelerio-Corynephoretea* (incl. *Sedo- Scleranthetea*, *Festucetea vaginatae*), *Festuco-Brometea*, *Trifolio-Geranietea sanguinei*, *Elyno-Seslerietea* (*Seslerietea albicantis*, *Kobresio myosuroidis-Seslerietea caerulea*) since 1931 to present. This means more then 7000 relevés from a surface of 120,000 km².

Syntaxonomy of *Artemisietea vulgaris* from Romania

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Question: How many associations of the *Artemisietea vulgaris* class are in Romania?

Location: Romania, all-around the country.

Methods: There were searched synoptic tables from the Romanian bibliography. They were counted and readjusted by syntaxonomy in Romania. According to this there were characterized each syntaxonomical unit.

Results: We notice 39 associations in 7 alliances and 2 orders in Romania. Commonly, the phytocoenoses of *Artemisietea vulgaris* have a luxuriant growing along the disruption slopes, the eroded edges of the rivers, quarries with an invasive character.

Conclusions: According the Romanian bibliography we notice that the approach of the *Artemisietea vulgaris* class study is more stinted then other vegetation classes; one reason could be the difficulty to get into many of these associations due to the dominant species (*Carduus acanthoides, Onopordum acanthium, Centaurea calcitrapa* with thorns on the leaves and steams). The enhancement of such a many zoo-antropogenetic impacts, in the last decades especially, lead to an expansion of those phytocoenoses, many allochthonous elements gain ground on many areas at impressive mileages.

The impact of climate change on native plant diversity in Ireland – predicting changes and informing adaptation measures

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Ireland's native flora is currently facing a multitude of threats including land-use change, habitat fragmentation and the introduction of non-native species. Future conservation strategies will increasingly need to consider the potential impacts of a changing climate, in particular shifts in the ranges of species for a variety of climate change scenarios. Here we report on a project exploring how predictive modelling techniques may be used to assess some of the potential impacts of climate change on Ireland's vulnerable plant species (*e.g.*, montane species, those plants at the southern end of their ranges, rare plants with restricted ranges, and those plants with poor dispersal capacities). A multi-model, multi-scenario (2055, 2075), multi-GCM framework is being used to project future species/habitat distribution changes. A blend of multivariate and regression modelling (GLMs, GAMs), along with existing bioclimatic modelling software for presence/absence (Neural Ensembles, BIOMOD) and presence only data (Maxent) are being used to understand current distributions and make future projections. Climate change data were generated using statistically downscaled outputs from the HadCM3 GCM. Predictive models are based on data reflecting 10 km x 10 km grid cells, spatially referenced to the Irish National Grid. Results to date show how plants such as the arctic alpine *Salix herbacea* at the southern edge of its distribution range may experience potential range contractions under future climate scenarios. The Habitats Directive requires that a "favourable" conservation status of vulnerable species and habitats is maintained. We propose to support this process by better integrating our understanding of the predicted impacts of climate change in the context of Ireland's designated site network helping to underpin our adaptation and mitigation strategies.

Developing predictive models for a climate change vulnerable blanket bog habitat in Ireland (I): assessing baseline climate relationships

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Aim: Understanding the spatial distribution of high priority habitats and developing predictive models using climate and environmental variables to replicate these distributions are desirable conservation goals. The aim of this study was to model and elucidate the contributions of climate and topography to the distribution of a priority blanket bog habitat in Ireland, and to examine how this might inform the development of a climate change predictive capacity for Peatlands in Ireland.

Methods: Ten climatic and two topographic variables were recorded for grid cells with a spatial resolution (grain size) of 10 km x 10 km, covering much of the land surface of Ireland. Presence-absence data were matched to these variables and generalised linear models (GLMs) fitted to identify the main climatic and terrain correlates for occurrence of the habitat. Candidate predictor variables were screened for collinearity, and the accuracy of the final fitted GLM was evaluated using fourfold cross-validation based on the area under the curve (AUC) derived from a receiver operating characteristic (ROC) plot. The GLM predicted habitat occurrence probability maps were mapped against the actual distributions using GIS techniques.

Results: Despite the apparent parsimony of the initial GLM using only climatic variables, further testing indicated collinearity among temperature and precipitation variables for example. Subsequent elimination of the collinear variables and inclusion of elevation data produced an excellent performance based on the AUC scores of the final GLM. Mean annual temperature and total mean annual precipitation in combination with elevation range were the most powerful explanatory variable group among those explored for the presence of bog habitat.

Main conclusions: The results confirm that this habitat distribution in general can be modelled well using the climatic and terrain variables tested at the grain size used. Mapping the GLM-predicted distribution to the observed distribution produced useful results in replicating the projected occurrence of the habitat distribution over an extensive area. The methods developed will usefully inform future climate change predictive modelling for Ireland.

Forest vegetation of the Korean Peninsula – introductory facts

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A database with 1753 relevés covers main gradients and composition of forests from the sealevel to highest peaks (Paektusan, Hallasan) of the whole Korean peninsula. Altogether, 38 principal studies published in Korean journals and monographs in the last 30 years were recherched. The occurence of natural or semi-natural forest stand was a selection criterion to include a record into the database. The relevés were sampled using the standard Zürich-Montpellier methodology, with the Braun-Blanquet semiquantitative scale. The mean species richness is ca 30 species per a relevé (moss layer excluded). The relevé area over 100 m^2 occurs in 35.2% of them and the size of 400 m^2 in 23.6%, respectively. The vertical distribution of the relevés mirrors the land geomorphology, so 31% was recorded below 500 m, 34.9% was recorded in the belt 500–1000 m, 18.5% was recorded in the belt 1000–1500 m and 7.1% of relevés comes from the highest stands. For 8.5% of records (N = 149) the altitude was not determined. We plan to expand the database by adding forest phytosociological records from the National Forest Inventory in Korea (about 5000 relevés with vernacular plant species names).

Applying vegetation databases in climatic vulnerability assessments: a case study from Hungary

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Vulnerability assessments provide a general tool for estimating the climatic risks and uncertainties of places, groups or other well-defined objects. In this framework vulnerability is quantified based on the exposure, sensitivity and adaptive capacity for the objects, which are modelled or estimated via indicators during the process. This type of assessments, recommended by the IPCC, is particularly well-suited for integrating different disciplines, and vegetation databases can constitute a major data source for estimating the ecological vulnerability of larger areas.

In our study we provide a complete vulnaribility assessment for the natural and semi-natural ecosystems in Hungary, based on the MÉTA vegetation database. The objects of the analysis were the major vegetation types of Hungary. To quantify exposure we downscaled climatic projections for six combinations of 3 different GCM models and emission scenarios. Sensitivity was estimated by fitting correlative bioclimatic envelope models, and potential impact was calculated by projecting the bioclimatic envelopes onto the future climatic scenarios. Adaptive capacity was estimated at a landscape scale using landscape ecological evaluation of the quality and distribution of habitat patches. Three groups of adaptive capacity indicators were identified, describing (1) the potential resilience of the individual habitat patches, (2) the local refuge-providing ability of the landscape, and (3) the connectivity and permeability of the landscape.

By combining results of exposure, sensitivity and adaptive capacity, the ecological vulnerability of the study area can be analysed and presented in a policy relevant structure. Results can be flexibly disaggregated, and can be applied in several policy contexts, including evaluating potential climate change adaptation/mitigation measures. This case study, prepared for the official National Climate Change Strategy in Hungary, provides an illustration for such uses. Due to the generality of the approach, this framework can potentially be applied as an “ecosystems" part of multi-sectoral integrated climatic vulnerability assessments.

European Dry Grassland Group (EDGG): a network for dry grassland research and conservation

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The European Dry Grassland Group (EDGG) has been established in August 2008 as an informal network of dry grassland researchers and conservationists throughout Europe. Meanwhile, we gained more than 400 members from 40 countries. Research interests of its members include all aspects of dry grasslands: flora, fauna, diversity, ecology, population biology, management, conservation, restoration, environmental legislation and education. EDGG has become an official Working Group of the International Association for Vegetation (IAVS). Presently, the EDGG has three regional subgroups (German Arbeitsgruppe Trockenrasen, Working Group on Dry Grasslands in the Nordic and Baltic Region, and Mediterranean Dry Grasslands), and a fourth regional subgroup for SE Europe likely will be founded during the 9th international Meeting on Vegetation Databases in Hamburg.

The basic aim of the EDGG is to stimulate the exchange of ideas and data as well as cooperation across national borders. For this purpose, EDGG has developed four major tools:

- the homepage (htttp://www.edgg.org);
- the newsletter with a quarterly periodicity (http://www.edgg.org/publications.htm);
- the mailing list for urgent issues; and
- annual conferences at varying topics and locations (http://www.edgg.org/events.htm).

During the short time of its existence, the EDGG provided its members with relevant information on the past and forthcoming scientific events and new publications. Moreover, a forum for questions, calls and other communication forms is available through the homepage or Bulletin of the EDGG.. A specific focus of the EDGG and its regional subgroups is the establishment of national and supranational vegetation databases of dry grasslands and related vegetation types, and their subsequent connection and analysis.

The 7th European Dry Grassland Meeting will be held from 28 May to 1 Juni in Smolenice (Slovakia) with the main topic “Succession, restoration and management of dry grasslands” (registration is already completed). In July 2010, there will be a joint EDGG field work in Ukraine and in 2011 the 8th European Dry Grassland Meeting is scheduled for Uman’, Ukraine.

Finally, we cordially invite all interested colleagues to join EDGG (without any obligations) and to contribute to its activities – just contact the first author, who is membership adminstrator.

Constancy depends on plot size – consequences for vegetation classification and data sampling

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Question: While it is well known that species richness depends on plot size, it is not generally recognised that the same must be true for constancy. Accordingly, many authors use varying plot sizes when classifying vegetation based on the comparison of constancies between groups of plots. We ask whether the constancy-area relationship follows a general rule, how strong the effect of plot sizes is on constancies, and if it is possible to correct constancies for area.

Location: For empirical evaluation, we use data from plant communities in Czechia, Sweden, and Russia.

Methods: To assess the potential influence of differences in plot size on constancies, we develop a mathematical model. Then, we use series of nested-plot species richness data from a wide range of community types (herbaceous and forest) to determine the parameters of the derived function and to test how much the shape of the constancy-area relationship depends on taxa or vegetation types.

Results: Generally, the constancy-area relationship can be described by $C(A) = 1 - (1 - C_0)^{(A/A0)\wedge d}$, with C being the constancy, A the area, C_0 the known constancy on a specific area A_0, and d a damping parameter accounting for spatial autocorrelation. As predicted by this function, constancies in plant communities always varied from values near 0% to near 100% if plot sizes were changed sufficiently. For the studied vegetation types, a two- to fourfold increase in plot size resulted in a change of conventional constancy classes, i.e. an increase of constancy by 20% or more.

Conclusions: Vegetation classification, which largely relies on constancy values, irrespective of whether traditional or modern fidelity definitions are used, is strongly prone to distorting scale-effects when relevés of different plot sizes are combined in studies. The constancy-area functions presented allow an approximate transformation of constancies to other plot sizes but are flawed by idiosyncrasies of taxa and vegetation types. Thus, we conclude that the best solution for future surveys is to apply uniform plot sizes within a few *a priori* delimited formations and to determine diagnostic species only within these formations. Finally, we suggest that more detailed analyses of constancy-area relationships can contribute to a better understanding of species-area relationships because the latter are the summation of the first for all species.

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Shapes of species richness curves depend on sampling design – Insights for richness extrapolations from a simulation study

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Aim: In ecological research, it is often not feasible to sample all species of a larger area comprehensively. Thus, various extrapolation techniques are frequently used to estimate the total species richness on a larger plot based on compositional data of nested subplots, namely (i) species-area relationships (SARs), (ii) species sampling relationships (SSRs), and (iii) (non-parametric) richness estimators based on SSRs. The suitability of these fundamentally different extrapolation approaches has hardly ever been tested in comparison. Here we use a simulation model of ecological communities to demonstrate the effects of different sampling schemes (SARs, SSRs) on shapes of species richness curves and their extrapolation capability.

Methods: We simulated five random communities with 100 species on a 64 × 64 grid using random fields. Then we sampled SARs (i.e. contiguous plots) as well as species sampling relationships (i.e. non-contiguous plots) from these communities, both for the full extent and the central quarter of the grid. Finally, we fit different functions (power, quadratic power, logarithmic, Michaelis-Menten, Lomolino) to the obtained data, and assessed their goodness-of-fit (Akaike weights) and their extrapolation capability (deviation of the predicted value from the true value).

Results: We found that power functions gave the best fit for SARs, while for SSRs saturation functions performed better. Curves constructed from data of 32^2 grid cells gave reasonable extrapolations for 64^2 grid cells for SARs irrespective whether samples were gathered from the full extent or the centre only. By contrast, SSRs worked well for extrapolation only in the latter case.

Conclusions: SARs and SSRs have fundamentally different curve shapes. Both sampling strategies can be used for extrapolation of species richness to a target area, but only SARs allow for extrapolation to a larger area than that sampled. These results confirm a fundamental difference between SARs and area-based SSRs and thus support their typological differentiation.

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Taking into account species ecological optimum in reserve networks selection

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Vegetation comprises a biodiversity surrogate that is commonly used in systematic conservation planning. The aim of the present study is to test the use of species fidelity values to vegetation units in the conservation networks selection algorithms, in order to ensure that species will be conserved in areas where they present their ecological optimum. The data sets used concern the beech forest vegetation of the Greek part of Mt. Rhodopi. Firstly, a vegetation map was made, in which each polygon represented one vegetation unit. Two data sets were tested, one representing the complete floristic composition of vegetation polygons (full data set), and a second in which species were considered as present only in the polygons of the vegetation units in which they present fidelity values at least as high as the 90% of their maximum fidelity (reduced data set). The data sets were used in the Marxan reserve system design software and two options were tested: one in which connectivity issues of the selected areas were not considered, and a second in which the length of shared boundaries between the polygons was considered in the selection algorithm.

Using the full data set almost 20% of the species were conserved in areas and vegetation units for which they present a rather low fidelity value. Although the reduced data set ensures that species will be conserved in vegetation units where they present their highest frequency of occurrence, it resulted in a threefold number of selected areas. The number of species conserved in unfavourable for them areas using the full data set was even more when connectivity issues of the resulted network were considered. While the areas selected using the reduced data set were less than twice those selected using the full data set in this case. Furthermore, the reduced data set resulted in a much better sampling of the geographical space and ecological conditions of the study area. Therefore, the use of species fidelity to vegetation units and habitat types may improve the selection of reserve networks increasing the possibilities of the existence of viable species populations in the selected areas and better representing the amplitude of an area's ecological conditions.

A classification of Nama Karoo vegetation in southern Namibia – first results

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This study aims at providing a first detailed classification of arid Nama Karoo vegetation in south-central Namibia in relation to selected environmental parameters. Additionally, it compares two different size scales of relevés (100 m^2 and 1000 m^2) to define which size is better suitable for classification of Nama Karoo shrubland. The study area lies north of Keetmanshoop (26° 34′S, 18° 8′O) and covers about 1800 km^2. With the aid of Landsat and Quickbird images and a geological map the study area was divided into seven classes based on geological formation and topography. A total of 212 vegetation relevés were then assigned to these classes and conducted in 2008 and 2009. In addition to the vegetation relevés, environmental parameters were recorded in the field and soil samples taken. The gathered information was handled with BIOTABase data base software. Using BIOTABase, we were able to also incorporate data that was collected in previous years. The vegetation relevés were classified with a modified Two-Way Indicator Species Analysis (TWINSPAN). To determine driving factors in differentiation of vegetation patterns, the created units' ecological parameters were checked for significant differences with analysis of variance (ANOVA). The results for the different size scales were compared. The classification of 1000-m^2 plots was further modified by hand to improve ecological significance.

Throughout the study area, 243 plant species from 54 families were recorded. We found 5 to 61 plant species in each 1000-m^2 plot, with an average of 29 species. *Poaceae* (17% of all recorded species) was by far the most common family in terms of species richness followed by Asteraceae (9%) and *Fabaceae* (7%). The species with the highest constancy were the perennial grass *Stipagrostis uniplumis* (76% constancy), and the annual grasses *Schmidtia kalahariensi* (64%) and *Aristida adscensionis* (60%). Of the recorded parameters, the main driving factors for vegetation differentiation were soil depth, pH value and lime content. The analysis of the 1000-m^2 plots resulted in more meaningful units and was used for the final classification. It resulted in two classes, three orders, six alliances and ten associations. The main difference in site conditions between the two classes was lime content. Class 1 represented habitats with higher lime content, mostly species-poor grasslands in plains. It consists of the *Stipagrostis ciliata* alliance, *Stipagrostis obtusa-Tribulus cristatus* alliance, and the *Zygophyllum decumbens-Stipagrostis anomala* alliance (consisting of three associations). Class 2 is characterized by the lower lime content of the sites, and it included the relevés on rocky outcrops. It consisted of the *Panicum arbusculum-Barleria rigida* order and the *Tetragonia schenckii-Acacia nebrownii* order. The *Panicum arbusculum-Barleria rigida* order comprises three associations. The *Tetragonia schenckii-Acacia nebrownii* order consists of the *Eragrostis porosa-Hyperthelis salsoloides* alliance and the *Microcharis disjuncta-Mollugo cerviana* alliance (each consisting of three associations).

This study provides an abstract tool for vegetation description and allows land managers, stake holders etc. to define vegetation types and provides associated plant lists for identification in the field.

Nine years of standardized biodiversity monitoring in Southern Africa – overview of vegetation data available in BIOTABase

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In 2001, the BIOTA Southern Africa project started a standardized long-term monitoring of vegetation throughout Namibia and the western parts of South Africa, covering the major arid and semi-arid biomes of the southern African subcontinent (i.e. Woodland, Savanna, Nama Karoo, Desert, Succulent Karoo, and Fynbos). Within 36 standardized and permanent BIOTA Biodiversity Observatories, which are 1 km² in size and subdivided into hundred hectare plots, vegetation has been annually monitored on marked subplots within 20 hectare plots of highest rank per Observatory. The aim is to monitor spatio-temporal patterns in phytodiversity of various vegetation types at different spatial scales and relate them to the main environmental drivers such as climate and land use.

The annually recorded data comprise vegetation and phytodiversity data: abundance per perennial species and cover values by layer on 100 m² plots, cover values by layer on 1000 m² and mere presence of species on the entire hectare plot. Currently, for most of the BIOTA Observatories time-series in vegetation data from 2001-2009, for others a shorter period, have been stored and processed by employing the database software BIOTABase. For each vascular plant species, a standard catalogue of plant traits such as life form and growth form has been assessed, and for certain species an extended list of functional traits. In addition, the database provides plot-based environmental data such as aspect and inclination, soil type, surface cover in percent of litter, dung, and stones and bare ground, as well as land use and climate data on BIOTA Observatory scale.

The data are used by researchers of the BIOTA Southern Africa project and beyond. They are accessible in a raw data or metadata format to other researchers, stakeholders and the public on request (www.biota-africa.org).

Thermal limits of tree species in the Bavarian Alps

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Thermal limits of tree species are of paramount interest in projecting effects of climate warming. While models of zonal species limits may be based on distribution areas and grid maps, detecting altitudinal limits in mountains requires high resolution species occurrence data such as phytosociological relevés. Based on the database BERGWALD tree species occurrence along a regional elevation gradient was assessed separately for tree and regeneration layer individuals. Upper limits in the databank were compared to altitudinal limits given in Oberdorfer's regional flora and to northern latitudinal limits given in worldwide distribution maps.

For 13 of the 30 tree species, the known distribution limits had to be raised based on relevé data, demonstrating the high potential of phytosociological databases to deliver ecological information. Regional altitudinal and global latitudinal limits were quite closely related for the majority of tree species. However, several tree species climb to higher elevation in the Alps than their latitudinal limits suggest. While the endemites *Larix decidua*, *Pinus cembra* and *Abies alba* have boreal sister species occurring beyond the montane-boreal disjunction posed by North-Central European lowlands, *Acer pseudoplatanus*, *Fagus sylvatica* and *Taxus baccata* are important elements of temperate mountain forests that have no counterpart in the boreal zone.

Based on the altitudinal advance of regeneration compared to tree occurrences, *Taxus baccata*, *Sorbus aucuparia*, *Acer pseudoplatanus*, *Sorbus aria* and *Picea abies* have the highest potential to naturally fill the new high elevation habitat created by warming in the study region. *Pinus cembra* is the only tree species with a clear lower distribution limit in the study region, suggesting physiological or phytopathological constraints and gloomy prospects under climate warming. Occurrences in early successional and extreme habitats at low elevation demonstrate that all other “subalpine" tree species are restricted by competition rather than physiology.

Poster #20

Selecting tree species under climate change: A distribution model approach

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Successful forestry requires compliance between bioclimatic and chemo-physical site conditions and the ecological traits of a tree species growing on that site. Climate change induces considerable changes in forest site conditions and therefore adaptation of forest management within the next rotation period is required. The risk in cultivating a tree species can only be limited if the requirements of the species suits site conditions, e.g. precipitation and temperature regime, today and in future. Hence, we have to answer the question above respectively below which threshold values a successful cultivation is possible. We try to identify the ecological niche of tree species via species distribution models (SDM) for the most important species cultivated in Bavaria. Due to planting and management in forestry natural dispersion barriers and competition can be neglected in our approach. We use two statistical techniques to determine the SDM: Generalised Additive Models (GAM) and newer Classification and Regression Tree techniques. Our database is the Second National Forest Inventory (BWI², a 4 × 4 km² grid) and will in future be complemented with the European large-scale forest condition monitoring (Level I, a 16 × 16 km² grid). We assign these plots site condition data (relief, climate and soil data as far as possible). An important step is to match the model output with a suitability classification and to determine a cultivation risk.

Our approach (variable selection, modelling and cartographic implementation) is presented using silver fir (*Abies alba*) as an example, a species for which the environmental limits (thresholds) in Bavaria are well defined. We therefore consider the Bavarian subset of BWI² as an adequate database to cover the niche of that species. The project will be terminated until 2012 and is funded by the Bavarian Climate Program 2020. Our threshold values will provide information to support the conversion of forests towards low-risk stands under changing environment. This conversion is also within the scope of the Bavarian Climate Program 2020.

Online presentation of vegetation monitoring data from BIOTA Biodiversity Observatories

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Since the start of the BIOTA AFRICA initiative nine years ago, a huge amount of vegetation data has been collected from standardised biodiversity observatories. Time series of vegetation data are available which have been collected in plots of different sizes as well as in nested locations. Presenting such data on a webpage is however a challenge. We have responded to this challenge by developing a solution that allows free and continuous access to the vegetation data. At the moment, the data of two biodiversity observatories of BIOTA Maroc, Taoujgalt (TAO) and El Miyit (EMY), can be visited online.

From the BIOTA AFRICA homepage, the visitor can easily reach the fact sheets of the biodiversity observatories. These fact sheets provide baseline information about the observatories. From there a mouse click leads directly to the vegetation page of that observatory.

http://www.biota-africa.org > BIOTA Maroc > Taoujgalt (TAO) > Vegetation

The entry webpage shows an interactive observatory map which divides the observatory into 100 hectares and which shows details about habitat features symbolised by different colours. Numbers indicate the rank of each hectare and, thus, the sampling priority. If the user wants further information on plot number, ranking and geographical coordinates he only has to click on the ranking number in the map.

The user can browse for hectares and years in which vegetation surveys have been performed. In a query form he can select year and plot size. Again an interactive map of the observatory grid will appear, this time indicating the species richness of the plots in the respective year. By clicking on a number a list with the scientific names of all occurring species will appear. The query form allows the user to filter life forms or life cycle durations. To compare the results of two queries with each other, it is possible to use a second query form independently. This feature allows the user to visualise firstly temporal changes over time, and secondly differences between plot sizes or between locations.

Thus, stakeholders and scientists have the possibility to screen the data for interesting data sets and patterns. If they want to analyse the data thoroughly, they can order the datasets from the BIOTA Data Facility (subject to the signature of the BIOTA Data Sharing Protocol).

BIOTABase – Software for biodiversity monitoring data

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The vegetation database software BIOTABase has been developed to facilitate the structured storage and processing of vegetation monitoring data and related environmental data. The need for such a novel software emerged in the context of the biodiversity long-term monitoring project BIOTA AFRICA. The database architecture meets specific environmental monitoring requirements like the handling of time series, as well as nested and individual-based monitoring plots. The software is able to handle a very wide range of environmental parameters, but also structural, phenological, functional and taxonomic features of plant taxa. Interoperability with geographic information systems as e.g. ArcGIS® and global datasets as e.g. FAO SOTER database (Global and National Soils and Terrain Digital Databases) allows thorough analyses of spatial pattern in large datasets. The software allows direct linkages between observation data, collection data as well as nomenclatural and ecological reference data on taxa. The process of taxonomic identification of specimens and nomenclatural changes can be easily applied and documented by controlled update routines. Finally, the BIOTABase package comprises tools for splitting and merging the data base as well as multiple export routines, which allow easy data exchange and thus satisfies the requirements of single users, of large database projects and of decentralised research networks.

The tool BIOTACollections is a lean version of the software. BIOTACollections has been developed to facilitate the storage of plant collections and corresponding observation data like species name, locality, latitude and longitude, collector and collection date, herbarium identification or data source, and some free text fields for observations or annotations. The interface to geographical information systems enables the user to locate each record on the map. Filter tools support the extraction of selected data.

BIOTABase and BIOTACollections are developed and continuously updated by the working group for Biodiversity of Plants at the Biocentre Klein Flottbek and Botanical Garden, University of Hamburg. The software can be downloaded free of charge from the BIOTA AFRICA webpage (http://www.biota-africa.org), together with a short manual, an example dataset and the three extensions. African datasets are available on request.

BASECO: a French Mediterranean floristic traits database

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The French Mediterranean zone is one of the richest of the country, with many endemics. Because of its interest as a synthetic tool to store and manage data, an ecological Mediterranean flora database was created. BASECO allows several queries about the botanical and ecological characteristics of about 1800 plants. Each species is identified by a code and is characterised by several qualitative traits relating to morphology, reproduction, life forms and biogeographical distribution, including several modalities. Each trait is informed from one or two pre-defined reference botanical handbooks as much as possible. There are many different possible uses of this database, even at a huge ecological scale, allowing to reveal patterns hard to detect with the taxonomic approach alone.

Climate-change effects on structural and functional plant diversity in the Northern Apennines

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Climate change produces a potential shift in the distribution of suitable species-niches along latitudinal and altitudinal gradients. This shift affects different species distribution, causing changes in floristic diversity at different levels of integration: alfa, beta and gamma diversities - and also a variation in functional aspects, such as phenology.

In order to investigate the ecological niches of the more important species sensitive to climate change and to study the effects of temperature increase on vegetation, we used a data set collected from the Alpe delle Tre Potenze, one of the highest peaks of the Northern Apennines.

The study area concerns the Western and the Eastern slopes of the mountain, from 1500 m up to the crest and the summit (1940 m). A total of 122 plots, 61 for each slope, were randomly sampled and stratified according to a 100-m altitudinal range. Each plot position was established using a GPS. The 5 × 5 m (25 m²) plot was built up by orientating its sides in North-South and East-West directions. It was then divided into 16 sub-squares of 1.25 m².

For each plot we recorded the stational data (exposure, slope, altitude), the vegetation cover and the species presence, assigning them a coverage value using a sliding scale of 1 to 100. A few sampled points were finally chosen to monitore the phenology of some species during specific time periods (approximately every 10 days) of their growth season. For this a general BBCH scale was used. In this way the main phenological stages of various species were detected relating them with the climatic parameters of the area. We were able to find the climatic and ecological niche for many species in order to understand and predict how they will move in adaptation to new conditions imposed by climate change. Using five data loggers at 1.60 m from the ground (two for each sides and one for the top) we recorded both air and soil temperatures. Rainfalls during the growth season were recorded by a simple pluviometer.

GLORIA – the Global Observation Research Initiative in Alpine Environments

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GLORIA – the Global Observation Research Initiative in Alpine Environments - is a monitoring network for climate change impacts on high mountain environments worldwide. Starting in 2000, the consortium currently consists of around 70 partner groups which apply the GLORIA standard methods in their respective mountain systems. The Central GLORIA database is maintained by the coordination group at the University of Vienna. It hosts species lists and cover data from standard plots on various spatial levels, from the 10x10 cm scale to full summit areas, as well as soil temperature series. At the present stage, the database aims as an information hub within the GLORIA consortium itself; opening to the public is an option for the future.

UIBM – the Universal Individual-Based Model

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After blind-reading several hundred compendia on ecological theory, ecological modeling and computer science I developed the vision that vegetation databases should drive biodiversity models to allow for virtual bio-manipulation and climate change scenario experiments. With UIBM, I followed my vision.

UIBM is a next generation biodiversity model.

It integrates an individual-/agent-based plant growth model with a functional-structural basis. In the pilot study the structure of a template species, namely False Oat-grass (*Arrhenatherum elatius*), has been constructed from trait minima/maxima contained in trait databases of the Central-European Flora using "Universal Scaling Laws" and "Serial Biological Reasoning". Plant functions with known dependence on climate change factors, such as organ energy balance, photosynthesis, maintenance respiration and ageing, form the other basis to this model.

Since the trait information is identical for all species contained in the databases, UIBM is capable to simulate the response of all Central-European herbaceous plant communities to major climate change factors – if and only if further model development is supported and parameterization of larger numbers of species is funded.

UIBM, in principle, has realized already most of the goals formulated in position papers of the US-American biodiversity modeling community. The UIBM software project is hosted by the SourceForge web portal. Please feel free to read project details at http://uibm-de.sourceforge.net.

The BIOTA Biodiversity Observatories in Africa – A standardised framework for large-scale environmental monitoring

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One main challenge for biodiversity research on a regional or global scale is to guarantee comparability of biodiversity assessment through standardization in sampling design and methodology. Such a standardized design should be suitable for different biomes, should allow spatial scaling up, long-term monitoring as well as facilitation of interdisciplinary approach in a global or at least regional network. In 2000, when the international, interdisciplinary biodiversity research project BIOTA AFRICA (Biodiversity Monitoring Transect Analysis in Africa, www.biota-africa.org) initiated a standardized biodiversity monitoring network across Africa, no such monitoring design that met the criteria above was available. BIOTA AFRICA accepted the challenge and developed and implemented the required standardized design: the BIOTA Biodiversity Observatory. The BIOTA Observatories are spatially explicit, interdisciplinary long-term observation sites which provide the necessary infrastructure for assessing the current state of biodiversity. They are designed to monitor the dynamics of the ecosystems in general and the change of biodiversity in particular. A BIOTA Observatory encompasses an area of 1 km² (1000 m × 1000 m), which are strictly North-South oriented and subdivided into one hundred hectare plots (100 m × 100 m). The hectare plot constitutes the largest sampling unit. To accommodate the sampling needs for different organism groups, the hectare plot is again subdivided into standardized subplots. In order to allow for different sampling intensities but nevertheless characterize the whole square kilometre, the number of hectare plots to be sampled may depend on the requirements of discipline and research question. However, a hierarchical ranking of the hectare plots ensures that all disciplines conduct their monitoring on the identical hectare plots. In regions with differing landuse types (e.g. different grazing intensities), two or more BIOTA Observatories are situated close to each other to cover the landuse effect. BIOTA Observatories have been installed along climatic, landuse and landscape gradients in Southern Africa (BIOTA Southern Africa), West Africa (BIOTA West), and Morocco (BIOTA Maroc). Over a period of nine years (2001–2009), field and remote sensing data on overall 45 Observatories were sampled by scientists from approx. 50 African and German institutions, representing various disciplines (i.e. botany, zoology, mycology, lichenology, soil science, climatology and socio-economy). The BIOTA Observatory design assures comparable, repeated, multidisciplinary recordings of biodiversity at a standardised sampling design which allows for spatial up- and downscaling and different sampling intensities. The BIOTA Observatories contribute to the long-term biodiversity monitoring obligation of the host countries as required from countries that signed the Convention on Biological Diversity (CBD) and provide infrastructure and baseline data for ecological research projects.

Effects of grazing intensity and rainfall on plant population dynamics in the Succulent Karoo, South Africa

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The Succulent Karoo (South Africa) is a semi-arid winter rainfall desert with exceptionally high biodiversity and endemism. One of the major threats to its biodiversity is heavy livestock grazing. In addition, recent climate change projections indicate a decrease in rainfall for this area, which also may affect biodiversity negatively. The aim of this study was to analyze trends in population dynamics of dominant perennial plant species at different grazing intensities and to discuss the results with respect to rainfall patterns.

Data were collected in the Kamiesberg region on a pair of two BIOTA Biodiversity Observatories (30° 23' S; 18° 16' E), of which one is grazed with high intensity and strongly degraded, while the other is grazed with low intensity and in good condition. On the overgrazed site a diverse shrub community is often replaced by the species *Galenia africana*, which is unpalatable to livestock.

We monitored the abundances of 52 perennial plant species over seven years from 2002–2008, on 36 permanent plots. Rainfall data were obtained from a weather station positioned adjacent to the BIOTA Observatories. Relative changes in abundance from year to year were analyzed by ANCOVAs to assess differences between the two grazing intensities and by linear regressions in order to reveal population trends over the period of the seven years.

Total number of plant individuals slightly increased over the seven years, irrespective of the grazing intensity. Species-wise analyses of relative population sizes revealed, that population size of most species remained constant over the study period, while 14 species showed significant increase and 6 species significant decrease in population size. On the intensively grazed site, the percentage of species with significant changes in population size was higher (38%) than on the site grazed with low intensity (29%). For 11 species, the trends in population size depended on grazing intensity. Among these are key species like the highly palatable *Asteraceae* species *Hirpicium alienatum* that only increased on the less grazed site or the poisonous *Euphorbia mauritanica* increasing only on the intensively grazed site

Following a dry period in the years 2002–2004, populations of most species showed a decline in the years 2005–2006. By contrast the *Aizoaceae* species *Galenia africana*, a toxic degradation indicator, increased in these years, probably benefiting from decreased competition.

We draw the conclusion that the vegetation on the studied rangeland is still diverging as a result of the different grazing intensities. A possible decrease in rainfall due to climate change may affect population sizes of some species negatively and at the same time indirectly influence population growth of other species positively via competition dynamics.

Vegetation dynamics of beech forests on limestone over half a century – effects of climate change, forest management, eutrophication or game browsing?

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Changes in the vegetation of sub-oceanic, sub-montane, mesic beech forests on limestone (*Hordelymo-Fagetum lathyretosum*), rich in spring geophytes (*Allium ursinum*, *Corydalis cava*, *Gagea lutea*, *Leucojum vernum*), were investigated by comparing vegetation relevés recorded in 1955–1968 and 2009 in the Göttinger Wald (Southern Lower Saxony). During the past decades beech (*Fagus sylvatica*) decreased in the tree layer, while valuable broad-leaved tree species such as *Fraxinus excelsior*, *Acer platanoides* and *A. pseudoplatanus* increased. A shrub layer was scarcely present fourty to fifty years ago, but is common today. The same is true for the natural regeneration of tree species in the herb layer. Changes in tree species composition and the overall increase of woody regeneration were mainly caused by changes in forest management and the reduction of roe deer browsing, while the atmospheric N deposition supported the increase of some herb layer species (e.g. *A. ursinum*, *Urtica dioica*) and led to a rise in the cover weighted mean Ellenberg indicator value for nitrogen. Next to the influence of atmospheric N deposition, spring geophytes such as *A. ursinum* or *Corydalis cava*, but also evergreen broad-leaved (laurophyllous) species like *Hedera helix*, have also profited from the trend of mild winters and the earlier start of the vegetation period, which can be attributed to global warming (global climate change). This is supported by a shift to more oceanic conditions in the last 50 years, when regarding the indicator value for continentality. In contrast, no indication for climate change could be detected by using the Ellenberg indicator values for water and temperature.

Photo guides to plants of Southern Africa and southern Morocco

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African plants have evolved a diversity of forms, functions and habitats. Due to the limited number of print publications, the identification of correct species names is still a large problem, especially when large numbers of specimen need to be identified with a limited investment of manpower and time. Besides published keys and besides identification based on herbarium records, the fast screening of a sufficient number of good photographs can be a very fast approach to identification in many taxonomic groups. For this aim we developed regional online photo guides for southern Africa and southern Morocco in the frame of the BIOTA AFRICA initiative. These guides present plant photographs in a phylogenetic order thus allowing rapid visual comparison. A number of tools allow the users to scan taxonomic groups like genera and families. Online accessibility will enable non-scientific stakeholders with limited access to taxonomic literature to gain knowledge on their regional flora and to identify plant taxa. Soon, the website will also allow users to identify unknown species by entering characters like flower colour, life form, growth form into a multi-access key. Tools like the vegetation database software BIOTABase allow a connection between this information basis and vegetation data.

The Photo Guide to Plants of Southern African (see: http://www.southernafricanplants.net) includes a good and rapidly growing representation of all known species of the southern African region. At present, Namibia and the western parts of South Africa are best represented, while a growing number of photos from Angola, Botswana, Zambia are also included. The Photo Guide to Plants of Southern Morocco (see: http://plantsofsouthernmorocco.biota-africa.net) aims at presenting the diversity of vascular plant species which occur in the transition zone between the High Atlas and the Sahara. Morocco is a hotspot of plant diversity in the western Mediterranean region, and the High Atlas mountains constitute an important centre of endemism in Morocco. The photo guide is mostly based on photos taken during field work in the Drâa catchment. Hence, this region is still best represented, but we intend to extend the covered area continuously.

The photo guide to southern African plants already received contributions (photographs, ID data, quality control checks) from the National Botanical Research Institute of Namibia (NBRI), the BioCentre Klein Flottbek, the Botanical Garden and Herbarium of the University of Hamburg, and independent botanists from Namibia and South Africa, while contributions from the South African National Biodiversity Institute (SANBI), the Harry Oppenheimer Okavango Research Centre (HOORC) and from Angolan colleagues at Luanda and Lubango have been announced. The Photo Guide to Plants of Southern Morocco received images from the Institut Agronomique et Vétérinaire Hassan II in Morocco and the BioCentre Klein Flottbek, the Botanical Garden and Herbarium of the University of Hamburg. We acknowledge the West African Photo Guide, published in 2008 by the colleagues of BIOTA West Africa, as being a model for our initiatives (see www.westafricanplants.senckenberg.de). Together, the three online photo guides give free access to a large number of African plant species.

We cordially invite botanically skilled photographers, botanists and interested institutions to contribute to the photo guides, in order to make species information available to African stakeholders for education, planning and conservation purposes.

Changes of plant diversity in riparian grassland after extreme hydrologic events

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Grasslands dominate the floodplains along the river Elbe. In a monitoring project, vegetation data of a riparian grassland site were collected in three different periods over twelve years. The effects of two extreme hydrologic events, the summer flood of 2002 and the extreme low water of 2003 on plant diversity, were analysed.

The study site near Steckby on the in the active floodplain of the Middle Elbe area shows typical, extensively managed grassland communities. 36 sampling plots of a size of 100 m² each were established based on a stratified random sampling design. The plots were classified into three classes according to their hydrology: flooded depressions with amphibian vegetation ($n = 15$), wet ($n = 7$) and moist grassland ($n = 14$). Vegetation in these plots was recorded twice a year using the classical Braun-Blanquet scale. The sampling periods were 1998 and 1999, 2003 to 2006 and 2009. For the description of plant diversity, species richness, the Shannon-Wiener index and Simpson's dominance index were calculated.

Between 1999 and 2003, species richness and Shannon diversity declined in all classes while Simpson's dominance increased. In the following years until 2009, species richness increased and reached even higher levels than before 2002 in wet and moist grassland. In these classes Shannon diversity and Simpson dominance reached values similar to those of 1998 and 1999. For the vegetation of the flooded depressions, these indices did not recover.

The observed extreme hydrologic events had a clear effect on species composition of the study site. While areas on higher elevations that are less frequently flooded gained species after few years, Shannon diversity reflecting the evenness of species' cover values in the assemblage needed a few more years to reach the level before 2002. The shift of cover values towards a stronger dominance of certain species after 2002 is reflected by the Simpson dominance index. Diversity and dominance were most strongly affected in the vegetation of flooded depressions. Due to the higher disturbance regime, even after six years, species composition remained less balanced and more dominated by single species as compared to 1998 or 1999. However, it remains uncertain if the flood event of 2002 or the drought of 2003 or both led to the observed changes in vegetation. A yearly monitoring (KLIWAS project) of these sites at least until 2013 may provide further understanding of the effect of extreme hydrologic events.

Plant names in vegetation databases – a neglected source of bias

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The increasing availability of vegetation databases holds great potential in ecological research and biodiversity informatics, However, an inconsistent application of plant names compromises the usefulness of these databases.

This problem has been acknowledged in recent years. and solutions have been proposed, such as the so-called concept synonymy. Unfortunately, awareness of the problem remains low among vegetation scientists. We demonstrate how misleading interpretations caused by inconsistent use of plant names might occur through the course of vegetation analysis, from relevés upward through increasingly integrated databases, and then to the final analyses. We then discuss how these problems might be minimised. We highlight the importance of taxonomic checklists (like the GermanSL, see Jansen & Dengler 2008) for standardising plant names and outline standards they should fulfil to be useful for vegetation databases.

Additionally, we present the R package *vegdata*, which is designed to solve name-related problems that arise when analysing vegetation databases. The package is especially easy to use when accessing data in Turboveg format.

We conclude that giving more consideration to the appropriate application of plant names, vegetation scientists might enhance the reliability of analyses from large vegetation databases.

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Re-sampling plots across Attica region (central Greece) in order to evaluate the effects of meteorological fluctuations on species diversity and performance

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Attica region is found on the easternmost part of Central Greece and is the most populated area of the country since Athens metropolitan area is included there. In most sites, apart from the higher elevation the mediterranean climate prevails. Nevertheless, there is a strong gradient of dryness, from north-west to south-east The sites of the later area are regarded as among the driest in Greece.

Mediterranean climate is characterized by high levels of unpredictability. In other words, even though the typical, annual succession of a dry, summer period by a wet, winter one is always the case, there are tremendous fluctuations, regarding, e.g. the precipitation height and duration or the temperature values. It has been noted that these meteorological fluctuations are projected to fluctuations in species diversity and abundance, which are primarily focused on geophytes and therophytes (Kutiel 1994, Kazanis 2005).

In order to estimate the magnitude of this phenomenon a network of 15 × 10 m² plots has been established across Attica region during the years 2008-2009. The main criteria for the selection of the study sites were (1) the existence of a reliable public or private meteorological station nearby and (2) the lowest possible degree of human disturbance. Species richness within the plots and twelve (12) permanent sub-plots is been recorded three times per year (mid-autumn, mid-spring and mid-summer) together with information on species phonological phases, while for some of the plots a more detailed (bi-monthly) sampling is performed. In the long term, this sampling scheme is expected to allow – through multi-variable analyses – the revelation of these climatic factors that play predominant role in species establishment and performance.

Which traits aid in invasiveness of clonal plant species?

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Many studies have investigated whether some species characteristics are more frequently associated with plant invasions than others. One of the patterns that frequently emerges for floras in different regions, is that among the invasive exotic plant species, clonal plant species are overrepresented. However, the determinants of this pattern are not known yet.

In this project, we try to elucidate the importance of different clonal plant traits for plant invasiveness using a data-base approach, combining data on clonality of Central European plant species and their global invasiveness.

Information on clonal plant traits was taken from the Clonal plants (Clopla) database. For about 2900 plant species, this database lists many different aspects of clonality (e.g. the kind of clonal growth organ, the amount of clonal lateral spread per year and the time daughter ramets remain connected to the mother ramets).

For each of the plant species in the Clopla database, we added information on 1) the invasiveness of the species in other parts of the world (USA federal noxious weed list, USA natural area invaders list and the global compendium of weeds), 2) its occurrence in Europe and the USA (DAISIE database, Flora Europaea, USDA plant database) and 3) plant species characteristics unrelated to clonality (Biolflor database).

Results from preliminary analyses will be presented and discussed.

Databases used

Clopla: www.butbn.cas.cz/clopla
USA noxious weeds: plants.usda.gov/java/noxious?rptType=Federal
USA natural area invaders: www.invasive.org/weedus/index.html
DAISIE: www.europe-aliens.org/
Flora Europaea: rbg-web2.rbge.org.uk/FE/fe.html
USDA plants: plants.usda.gov/classification.html
Biolflor: www.ufz.de/biolflor/index.jsp
Global compendium of weeds: Randall, R. (2002), A Global Compendium of Weeds., R.G. and F.J. Richardson, Meredith, Australia

New features in VegetWeb 2010

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As desired from many parties, the standard list GermanSL 1.1 (Jansen & Dengler 2008) was integrated in the german online vegetation database, hosted by the BfN.

Beside the yearly plot integration from the main german vegetation publication, Tüxenia, the data basis has been extended by the import of 14,800 vegetation plots, compiled from the federation agency of North Rhine Westfalia, LANUV.

The extended import and export abilities are presented with real data and the conception of VegetWeb in the future is discussed. Therefore, new features like global unique identifier and webservices have to be developed.

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National vegetation database of Taiwan

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National vegetation database of Taiwan was established in 2003 and preliminarily finished in 2007. This database was constructed for the purpose of conservation management and financially supported by the Taiwan Forestry Bureau. At the end of 2007, it contained 8035 relevés (vegetation plots) including 4471 taken from 112 published studies. These studies focused on phytosociological survey, ecological or timber production monitoring, and contained both permanent plots and plots from habitat survey for nature conservation. Relevés from published studies were made in 1979-2006, using different plot sizes and sampling methods. Most of these relevés recorded only trees and shrubs. The other 3564 relevés were made in 2003-2007 as a part of the vegetation mapping project which was also organized by the Taiwan Forestry Bureau. Plot size of these relevés was 20 × 20 m, but 5% of them were from larger plots with a maximum size of 50 m × 20 m. All the vascular plant species including trees, shrubs, climbers, epiphytes and herbs were recorded in these relevés. Diameter at breast height (DBH) was measured for trees and shrubs taller than 2 m. In the tree and shrub layers, the Importance Value Index (IVI; Curtis 1959) of each species was calculated and individual species abundance was defined as IVI multiplied by the total canopy cover. For species of climbers, epiphytes and herbs, cover was estimated and used as a measure of abundance.

Our national vegetation database only focuses on terrestrial vegetation types till now. Over 60% of the relevés locate at natural forests all over the whole country. The others are in the planted forests, secondary forests, shrublands and grasslands.

Hierarchical classification of the vegetation on the communal farmland of Soebatsfontein in the Succulent Karoo, South Africa

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This study aims to provide a first detailed hierarchical classification of the Namaqualand low land vegetation of the communal area of Soebatsfontein. We related the vegetation to habitat characteristics and grazing intensity of the recent past (1980s–2000s) and analyzed which factors determine diversity and composition of the vegetation. The study was carried out on the communal farmland (15,000 ha) of the Soebatsfontein settlement (30° 7' S, 17° 35' E) in Namaqualand (South Africa). The vegetation was recorded on randomly chosen plots (100 m^2) which were stratified according to five predefined habitat types and four different historic grazing intensities (high, intermediate, low, unknown). The relevés were classified using the modified Two-Way Indicator Species Analysis (TWINSPAN). The variability of structural, soil and vegetation parameter among the vegetation units were analyzed with analysis of variance (ANOVAs). The units of the TWINSPAN analysis were than slightly modified in order to improve the ecological relevance of the units. In total, 502 plant species out of 56 families were recorded. On average 22 species were found per 100 m^2 plot with a range of 4-51 species. The most frequent families were *Aizoaceae* and *Asteraceae* followed by Crassulaceae. The most constant species were *Galenia fruticosa* (66%), *Didelta carnosa* (51%) and *Trachyandra revoluta* (51%).

Water availability and soil pH were the main driving factors, responsible for vegetation differentiation. 17 associations within seven alliances, five orders and two classes are described, which are closely related to the named gradients. The *Karroochloa schismoides-Oncosiphon suffruticosum* Class (1) represents the vegetation on less saline soils. This unit contains vegetation communities of rocky slopes as well as sandy plains with higher water availability. The *Cephalopyllum inaequale-Didelta carnosa* class (2) represents the vegetation of the saline soils and was further subdivided into subunits referring to quartz field vegetation and the vegetation around heuweltjies (fossil termitaria). Findings include that the strong gradients of water availability and soil pH as well as high heterogeneity of habitats and soil types overlay the historic grazing effects on the scale of the present units.

As it classifies the complex vegetation patterns into the more comprehensive structure of vegetation units, this study provides a good base for further research concerning e.g. impacts of current grazing. This may help to improve management strategies with respect to sustainable and balanced use of resources for the benefit of both, the local people and biodiversity conservation.

Vegetation database of the Volga and the Ural Rivers Basins

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In 2004, the researchers from the Institute of the Ecology of the Volga River Basin of the Russian Academy of Sciences (Togliatti, Russia), Samara State Academy of Social Sciences and Humanities (Samara, Russia) and Institute of Steppe of the Urals Branch of the Russian Academy of Sciences (Orenburg, Russia) started work on creation of the Volga and the Ural Rivers Basins Vegetation Database on the basis of the software suite TURBOVEG (Hennekens & Schaminée, 2001). Information is collected in two blocks with separated data on geobotanical relevés and on the syntaxa uniting these relevés. In first case, each geobotanical relevé includes the following parameters: the species composition with projective cover for each species of plants; total projective cover; plot size; syntaxon which the relevé belongs to; its position in the SynBioSys Europe syntaxa system; geographical coordinates; ecotope and location, where the relevé was made; information on publication of the relevé (the reference, number of table, relevé number in the table). In second case, each syntaxon is provided with its name, position in the SynBioSys Europe syntaxa system, number of relevés and the permanence of each species. Currently, the database has information of halophytic (1930 relevés, 57 syntaxa), steppe (572 relevés, 14 syntaxa), meadow (127 relevés, 16 syntaxa) vegetation and karst relief vegetation (181 relevés, 20 syntaxa) in the Volga and the Ural River Basins within forest-steppe and steppe zones, and includes results of our own research activities (since 1994) and literature sources data (since 1969). The data is collected in each of the institutions mentioned above, and then the data is exchanged and summarized. Dr. T. Lysenko is the coordinator of the work carried out. The created database is connected with European Syntaxonomical Biological System SynBioSys Europe (www.synbiosys.alterra.nl/synbiosyseu) where the data on 567 published relevés and 71 syntaxa has been currently sent to. The data exchange among Russian, Ukrainian, Bulgarian and German scientists is implemented.

East-Mediterranean *Ammophiletea* database

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Aiming at a phytosociological review of *Ammophiletea* class in the East-Mediterranean coasts, in the years 2004-2007, about 2250 phytosociological relevés were collected from relevant bibliography (Marcenò, 2008). The collected data refer to the dune vegetation of North-Eastern Africa (Southern Tunisia, Libya and Egypt), Asia Minor (Palestine, Lebanon, Syria, Southern Anatolia), Cyprus, Crete, North Aegean, Marmara Sea and Black Sea.

All the vegetation relevés following the Braun-Blanquet´s scale (Braun-Blanquet 1964) have been digitized into Microsoft Excel table sheets, then unified in a single TURBOVEG-data-base (Hennekens & Schaminée 2001). Only the cover values (abundance-dominance) have been transcripted from the original relevés, eventual abundance index "r" had been replaced with " ". All plant names have been standardized following the most recent taxonomical revisions. The survey reports information on: syntaxonomy (up to the association-level), distribution range, distribution density of all relevés, approx. longitude and latitude (all relevés had been georeferenciated according to the original localities provided by the authors). In agreement with Schaminée & al. (2009), it is hoped that the data-base at issue will be useful in studies related to macroecological hypotheses and for nature conservation surveying or monitoring.

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Changes of EIVs in beech forests of SE Europe

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The aim of the research was to find out whether EIVs (Ellenberg Indicator Values) correlate with time in the database of beech forests of SE Europe. The database includes 2041 relevés from year 1954 to 2007. We tested the hypothesis on the whole database and also on the database divided on four subsets, presenting four suballiances (lowland and submontane, montane, altimontane and subalpine and thermophilous beech forests). We could not find the general trend but correlation between temperature and year of origin of the relevés was found in case of lowland and mountainous beech forests.

The work deals also with the result of this trend that might be, besides global changes, also related to the structure of the database itself.

A preliminary vegetation database analysis of mountain wetland habitats within Irano-Turanian climatic territory, N Iran

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The wetland habitats are sharply embedded within vegetation of the Irano-Turanian steppes that are more characteristic of this region and are of interest both in themselves and for wider comparison with Euro-Siberian wetlands. The Alborz Mts. (Western and Central sections), the second largest range in Iran, is, on its southern slopes, mainly covered by steppe vegetation. These dry slopes also include ‘green islands' of wetland with wide range of vegetation. Multivariate analysis of 990 phytosociological relevés collected across 135 of these little-studied wetland sites resulted in the subdivision of the wetland vegetation of the Alborz range into two large groups, referable to aquatic and telmatic wetlands. The latter were further sub-divided broadly into three end-groups (i.e. wet meadow, mire and spring vegetation) using Two Way Indicator Species Analysis (TWINSPAN). The TWINSPAN end-groups could be recognized in the Detrended Correspondence Analysis (DCA) graphs as well. The ordination of relevés along the first axis is closely related to the gradient from aquatic habitats toward wet meadow habitats. The occurrence of similar telmatic wetlands in other parts of Irano-Turanian region, as well as in adjacent Pontic and Mediterranean areas, examined and character species comparisons with these regions are discussed. Alborz telmatic wetland vegetation has broad affinities with three widespread European vegetation classes, i.e. *Molinio-Arrhenatheretea*, *Scheuchzerio-Caricetea fuscae* and *Montio-Cardaminetea*. Despite the high presence of many pluriregional plants across all the telmatic wetlands studied in Alborz, many species of the Irano-Turanian and adjacent areas are also found, and the communities are vicariant versions of Euro-Siberian telmatic vegetation. It is in very priority to conserve these wetlands in drylands of Iran. Climate change and ecosystem management are the main determining factors on the existence of such a sensitive ecosystem.

Analysing species density along altitudinal gradients on the Saharan fringe in southern Morocco with three different regression models

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The ecosystems of desert fringes and high mountains belong to those forecasted to be subject to drastic climatic changes over the next decades. A sound understanding of their diversity patterns is necessary baseline information for scenarios of biodiversity changes. Altitudinal gradients are important "natural experiments" as they comprise a broad directional bioclimatic effects at the regional scale, and orographic, microclimatic and edaphic effects as well as geological diversity that interact at local scales leading to gradually changing spatiotemporal patterns of plant diversity.

Semi-arid mountains have not yet been studied extensively for gradients of phytodiversity. Based on a dataset of about 1000 vegetation relevés from southern Morocco, we found a hump shaped distribution of species density on several environmental gradients with a mid-altitudinal peak. We tested three different types of regression models, e.g. monotonic-linear, polynomial-linear and non-linear piecewise for the relationship between species density and a set of climatic and bioclimatic parameters.

Depending on the variable, the different models showed considerable differences in the resulting fit, but also differed in the resulting response shapes, e.g. linear, hump shaped or broken-stick distributions. We found a tendency that climatic parameters were best explained by nonlinear regression, whereas bioclimatic parameters more often showed a linear response.

These findings demonstrate the importance of considering the effect of different statistical methods when species density is analysed along altitudinal gradients, particularly in arid environments. We further stress the importance of nonlinear-piecewise regression.

WebGIS – an online tool for the presentation of biodiversity data

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Long-term ecological monitoring produces large amounts of data. This is especially true for research projects comprising a multitude of disciplines that act as data-generators. A further level of complexity is reached when projects cooperate on an international level, implying complicate protocols on data exchange, extended data analysis and lengthy discussion on results. Another important issue is the transfer of research results to stakeholders and decision makers, possibly from different countries.

Recently developed Web 2.0 rich internet applications (RIA), which enhance the speed and the usability of online applications. Furthermore, they allow strengthening the communication by allowing for interactivity and connectedness between scientists all over the globe. The success of social networks like Facebook, Couchsurfing or Youtube, are promising examples that revive the idea of the world-wide-web as an interactive communication medium.

Geographic information systems (GIS) are increasingly used as an interactive online-information tool, often called *WebGIS* or *InternetGIS*, for presenting geodatasets and related information. However, ecological datasets are still scarcely presented despite their spatial nature and the general request for information on spatial patterns of biodiversity.

Using a set of software development tools, including ArcGIS Server 9.3, Dojo-Toolkit, Javascript, and relational database architecture, we have developed Web 2.0 applications that allow a spatial representation of different biodiversity datasets for hundreds of users at the same time.

The development framework and example applications are presented and discussed. The discussion includes the effort needed for programming and developing of these applications.

Modelling plant species and trait response curves along grazing gradients in central Namibia

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It is widely known that grazing has great effects on vegetation patterns, especially in semi-arid regions. Gradient analysis can reveal regularities in this patterning and thus can help to indentify indicators for a certain degree of grazing disturbance which is relevant for land management decisions.

We investigated the distribution of plant species and plant functional traits on seven farms in central Namibia along grazing gradients using Huisman-Olff-Fresco (HOF) modelling - a set of hierarchical regression models. Plant species response was assessed along piosphere transects (zones around livestock watering points) on different spatial scales: we compared the responses along short transects (150 m) with small inter-sample distances and long transects (1500 m) with greater spacing between samples. The responses of the traits life form, life cycle and growth form were modelled along the short transects. We calculated optima values and niche range for single species and traits. Additionally, we collected soil data (pH and electrical conductivity).

The pH-value and the electrical conductivity decreased with increasing distance from watering points. Total species cover of vascular plants decreased with higher grazing pressure. Distribution patterns and response curves varied widely between the species. Most species showed a stronger response to grazing along the short transects compared to the long transects. Along short transects 12 species decreased while ten species increased with increasing distance from the watering point . Along long transects four species decreased while nine increased with increasing distance from the watering point . The area of major disturbance was dominated by annual grasses like *Schmidtia kalahariensis* and prostrate forbs like *Tribulus terrestris*. Woody, perennial species increased in cover with increasing distance. Geophytes and therophytes were frequent around the borehole whereas chamaephytes and phanerophytes avoided this highly disturbed area.

Our results provide a baseline for naming indicator key species and traits for grazing impact in the studied region, which can be used by farmers for assessing the condition of their rangeland

Different ways to estimate 'realistic' plant species richness on 1 km² – A case study from a semi-arid savannah in Namibia

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Aim: To test different methodological approaches commonly used in ecology to quantify plant species richness at the scale of 1,000,000 m^2.

Location: BIOTA Biodiversity Observatories Narais and Duruchaus in a semi-arid savannah ecosystem of central Namibia.

Methods: Our vegetation sampling in the field consists of 20 randomly selected vegetation plots per Observatory (1 km^2). In a nested-plot design we sampled all plant species up to 1,000 m^2 (31.62 m × 31.62 m). Inside the main plot, quadratic sub-plots of 0.01 m^2, 0.1 m^2, 1 m^2, 10 m^2 and 100 m^2 were sampled with three replications (Dengler. In order to test the robustness of our estimates we combined our species list with those of the BIOTA monitoring scheme sampled between 2005-09 on these observatories. For each plot we applied different models describing the species-area relationship (SAR). With the best fitting functions (power, quadratic power, Lomolino) we extrapolated species richness from each single plot to the target scale of 1,000,000 m^2 and calculated the mean species number with the standard error (SE) for each Observatory. We constructed a rarefaction curve out of our 1,000-m^2 plot data, fitted different asymptotical models as species sampling relationship (SSR) (Michaelis-Menten, Lomolino, rational function), and determined the asymptote levels which are equivalent to the estimated species number. Additionally, we examined different incidence-based richness estimators with the software EstimateS (Colwell, 2006).

Results: We recorded 210 plant species on both observatories (170 at Duruchaus and 145 at Narais). Accumulated over all five observation years, 261 species were recorded (216 at Duruchaus, 195 at Narais). We found a wide range of estimated species numbers by extrapolating to the target scale with highest values for the power SAR and generally lower values for the SSR functions and richness estimators. Lomolino SAR also gave quite low species richness. For the SAR functions at Duruchaus, we noted moderately high standard errors, at Narais they were considerably lower. The curves of the richness estimators ICE, Chao 2 and Jackknife 2 showed a stable asymptote indicating an accurate estimation only for Duruchaus, not for Narais.

Conclusion: Methods that gave lower richness values than actually recorded should be rejected; namely Lomolino SAR, all SSR functions; except Lomolino SSR at Duruchaus, and all non-parametric richness estimators in our study. SAR extrapolation has to be handled with care because of the high standard error. Our multi-methodological approach needs further improvement while our comprehensive dataset sampled with different methods offers a great potential for validation.

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Plant diversity in the Biodiversity Exploratory Project

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The Biodiversity Exploratory Project funded by the German Science Foundation (DFG) investigates the effect of land-use intensity on biodiversity and ecosystem functioning in forest and grassland in three German regions. A common statistical design was employed in which 500 grassland plots and 500 forest plots were selected per region. Land-use intensity was assessed based on a forest inventory and on questionnaires submitted to farmers and land owners. A soil inventory assessed the type, depth and structure of soils on all plots. In each region, we recorded plant diversity based on plots of 20 m × 20 m in forests and 4 m × 4 m in grassland.

In grassland, fertilization was the most important factor, negatively affecting both alpha and beta diversity. However, its effect varied considerably among the three regions. This was also true for the effect of other land-use factors, such as type of livestock or number of harvests, which highlights the importance of regional replication for drawing general conclusions.

In forests, plant diversity was highest in managed coniferous forests, intermediate in managed deciduous forests and lowest in unmanaged forests. This effect was mainly due to the dominance of beech (*Fagus sylvatica*) and the lack of disturbance in unmanaged forests as indicated by the different response of shade- and light-demanding species. Plant diversity in forests is therefore a poor indicator of management intensity and other taxa, e.g. dead wood inhabiting insects or fungi, may be better suited to assess the conservation value of differently managed forests.

Our monitoring activities set the first step by assessing the diversity on large landscape level. More detailed studies are underway which use experimental manipulations and more laborious measurements, including seeding and disturbance experiments and the assessment of other taxa than plants.

In conclusion, the project illustrates the need for a common statistical design which compiles data on land use, forest management, soil type, and other relevant drivers of diversity. Only if activities of groups with different expertise (forestry, soil science, socioeconomics, and botany) are integrated, we will arrive at a comprehensive understanding of vegetation change.

Rarity of *Gladiolus palustris* caused by rarity of habitat? A comparison between *G. imbricatus* and *G. palustris*

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The aim of the project is to understand the reasons for rarity of *Gladiolus palustris* in comparison to the more common *G. imbricatus*. *G. palustris* is protected by EU Habitats Directive (Annex I) because of the rarity in its whole distribution range. A better understanding of the factors responsible for its rarity will allow the development of more effective conservation strategies.

One of the possible explanations for species rarity is a rarity of their habitat. To explore this, we thus attempt to characterize habitat requirements of the species using data on vegetation of the habitats in the form of phytosociological relevés and direct field measurements of habitat conditions. We use these data to test differences in vegetation composition of sites occupied by the two species. All the data will be linked to population growth rate of the species at the specific sites.

The results indicate that there are only limited differences in habitats of *G. imbricatus* and *G. palustris* from the Czech Republic suggesting that the species rarity in the Czech Republic can not be explained by rarity of the habitat.

Tundra vegetation change

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The International Tundra Experiment (ITEX) is a scientific network of experiments focusing on the impact of climate change on arctic and alpine tundra. Research teams at more than two dozen circumpolar sites have carried out similar, multi-year warming experiments using open topped chambers (OTC) that allow them to test the effects of climate on plant phenology, abundance, and composition to climate conditions.

As part of the International Polar Year, two ITEX synthesis projects are currently underway, examining how both the phenology of individual species and composition of tundra communities has shifted in response to ambient and experimental climate warming. For these syntheses, we are amassing data from both warmed and control plots throughout the ITEX network, as well as other monitoring sites throughout the tundra biome. We are in the process of building and analyzing two large databases in order to conduct a comprehensive analysis of plant phenological and community responses to climate change over the past several decades.

We encourage researchers with long-term data on tundra plant phenology or species composition to contribute to our world-wide meta-analysis.

Increasing plant biodiversity on mountain tops at the upper limit of dwarf shrub heath

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We present a new project on the changes of vascular plant composition on mountain tops over the last century. Starting at an elevation lower than most previous studies, our study covers the highest limits of alpine grasslands and dwarf shrub heaths, and therefore covers a zone of dramatic vegetation change.

Our core dataset contains full species lists from the early 20th century of 66 mountains in the vicinity of Davos, Switzerland. Their altitudes range from 2600 to 3400 m within a small geographical area. Species locations at lower altitude are moreover known from an extensive floristic study of Davos.

On 13 mountains between 2610 and 2750 m covered in 2009, we found an average increase of 40 species (68 to 108) between a 2600m threshold and the top of each mountain. Of the 239 species found, 34 were newly found above 2600m, occurring on average 213 m higher today. Most notable is the high number of small *Larix decidua*, *Picea abies* and *Pinus cembra* trees on several mountains.

A total of 181 species are more frequent today than before 1929, most of them typical species of *Nardus* grasslands and dwarf shrub heaths. Thirty species were less frequent in 2009 than in the early 20th century, but none vanished from more than two mountains.

We will extend this new dataset in the next summer with the goal to identify drivers of vegetation change and to disentangle the roles of climate change, land-use and population size of herbivores and hikers.

Predicting potential distribution of *Juniperus oxycedrus* in the High Atlas Mountains (Morocco)

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Introduction: Tree species native in the High Atlas Mountains like *Juniperus oxycedrus* cover today only a small percentage of their original range. Both for ecological and socio-economic reasons, conservation measures are urgently required. An effective conservation management of tree species however needs accurate estimates of species potential distribution.

Aim: Based on the assumption that at larger scale the potential distribution of *J. oxycedrus* in the High Atlas is mainly controlled by climatic conditions the present study aims at predicting its potential distribution from presence-only data and bioclimatic variables. Furthermore a second objective is to compare accuracy and spatial extent of predictions from three species distribution modelling approaches.

Methods: The study area encompasses the central High Atlas between 31–32° N and 4–7° W with an area of about 41.000 km^2. It was divided in 14 bioclimatic zones. Occurrence of *J. oxycedrus* was recorded along four transect zones in north-south direction. The modelling approaches Ecological Niche Factor Analysis (ENFA), Maximum Entropy approach (MaxEnt) and Generalized Linear Models (GLM) were applied to the presence-only data set of 154 species presences. The GLM approach requires besides presence data also species absences. As no reliable absences were available, GLM were calculated using artificial species pseudo-absences generated (i) at random and (ii) according to Maxent predictions. Maps of consistent predictions of ENFA, MaxEnt and GLM were calculated at the LPV 10-threshold, which corresponds to the lowest predicted value for species occurrence when allowing for omission of ten percent of species presences .

Results and discussion: Species distribution models calculated by ENFA, MaxEnt or GLM show good model quality according to evaluation measures. However application of the LPV 10-threshold makes their differences in spatial extent and distribution of predictions of high probability of occurrence clearly visible. While ENFA tends to underestimate species distribution, GLM gves overoptimistic predictions, probably due to an insufficient characterization of species niche in the environmental space. MaxEnt shows the most comprehensible results according to our knowledge of *J. oxycedurs* preferences regarding climatic conditions.

Conclusion: According to results of the present study a great percentage of the today almost completely deforested areas in north-western High Atlas, is suitable for the occurrence of *J. oxycedrus*. In addition, the results support the assumption that in many regions of the central and eastern High Atlas, where deforestation might have occurred often more than 100 years ago, current climatic conditions would still allow for reforestation with native *Juniperus* species instead of the almost exclusively planted non native *Cupressus arizonica* and *Pinus halepensis*.

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Plant functional traits show non-linear response to grazing

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Purpose: The trait based approach aims on detection of functional patterns in vegetation beyond specific sites or taxa. In most cases, plant traits are assumed to be linearly related to environmental gradients such as grazing intensity. To generalise results beyond specific sites, it is important to know to which extent environment-trait relationships are non-linear. Everything else constant, non-linearity can be a source of inconsistency among different studies according to length and studied portion of a gradient. In this study, we test if and to what extend traits relate non-linearly to a grazing gradient using data from a grassland-matorral interface in the Mediterranean rangeland of "La Crau" (SE France).

Methods: Grazing intensity of itinerant sheep flocks has been monitored using a marker plant, *Phillyrea angustifolia*, and several independent pasture indicators. First, traits have been related to grazing using a multivariate three table ordination method (RLQ) assuming linear reactions of traits. Second, to evaluate the importance of non-linearity, generalised additive models (GAMs) have been used which allow the detection of non-linear relations.

Results: GAMs revealed that a third of traits studied here showed non-linear relationships to grazing. These cover a large spectrum including seed mass, life form, phenology dispersal- and leaf traits.

Conclusions: The high part of non-linear relations compromises a general assumption of linear trait-environment relationships. Future works should therefore more often consider non-linear relationships using methods with no constraints on shape of response e.g. GAM in the analysis of functional trait studies. In this way, non-linear relationships can reveal new aspects of species and community response to global change and deepen our understanding of trait-environment.

What determines the distribution of plant species in the city of Hamburg?

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The distribution of plant species in a certain area is influenced by various factors. In urban ecosystems anthropogenic disturbance plays a major role. Urban areas are frequently and severely disturbed by human action and therefore provide habitat conditions for plants differing from those in rural areas. The degree of sealed soil, building density, air and soil pollution as well as other factors usually decrease along an urban-to-rural gradient. Furthermore, the effect of the urban heat island and modified wind conditions in cities are considered to have an impact on species distribution. Plant species richness in cities is usually high in comparison to surrounding rural areas. Our study aims to assess the response of plant species in urban areas to climate change regarding future distribution, diversity and composition in the city of Hamburg. This study is part of the project KLIMZUG-NORD that develops adaptation strategies to climate change for the metropolitan region of Hamburg. The research area of integrated urban and spatial development explores which requirements of urban development have to be met in future.

We are analyzing a dataset of the floristic mapping project of Hamburg (by the Botanischer Verein zu Hamburg e. V.) that contains presence/absence data on vascular plant species on a 1-km² grid scale. Ordination and classification methods are used to analyze the relationships between plant species distribution and climate, land use and geology and to determine groups/patterns in vegetation. To evaluate possible future trends in species distribution, climate predictions will also be implicated in the analysis. Within the analysis alien plant species are of particular interest.

BioMonitoring Data Facility

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The BioMonitoring Data Facility forms a joint infrastructure of all regional projects, BIOTA Morocco, BIOTA East Africa, BIOTA West Africa, and BIOTA Southern Africa. BIOTA AFRICA (www.biota-africa.org) aims at providing robust scientific information about the current status, recent change and future development of biodiversity in hot spot areas of the African continent. The present activities of the BioMonitoring Data Facility include the continuous effort to inventory and archive all central BIOTA data, the presentation of data and information by internet and the web-facilitation of communication between all BIOTA partners.

Since the start of the BIOTA AFRICA project nine years ago, a wide array of digital data has been gathered by over 50 subprojects, work-packages, core topics of BIOTA and associated projects. Due to the different subjects and key questions within the various disciplines, this data is of relatively heterogeneous structure. For establishing a BIOTA AFRICA data archive, the data files in their different formats have been collected and archived in a central data pool at the Biocentre Klein Flottbek, University of Hamburg.

The internet offers the user an easy way to find out which kinds of data BIOTA AFRICA supplies. If a user wants data for analysis then he can call a request and download the result from the website www.biota-africa.org. This is possible if the data are available online, else requester may ask the data management. The conditions of data access are fixed in the Data Sharing Protocol of BIOTA AFRICA (see website item ‘Agreements’).

All biodiversity observatories are presented with information sheets. Besides general information, here the user can look for data linked with the respective observatory. The items are expanded continuously. It is also possible to look for a topic and then at which biodiversity observatories information is available. The user also gets some information which working groups supply data around the observatory or topic. Furthermore links to institutions or services like Google-Earth can help the user to learn more about the aspects of biodiversity of this location.

The BioMonitoring Data Facility forms a joint infrastructure of all regional projects, BIOTA Morocco, BIOTA East Africa, BIOTA West Africa, and BIOTA Southern Africa. BIOTA AFRICA aims at providing robust scientific information about the current status, recent change and future development of biodiversity in hot spot areas of the African continent. The present activities of the BioMonitoring Data Facility include the continuous effort to inventory and archive all central biota data, the presentation of data and information by internet and the web-facilitation of communication between all BIOTA partners.

Vegetation dynamics of endemic-rich quartz fields in the Succulent Karoo, South Africa, in response to an increase in rainfall variability and temperature

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Question: How did species composition and abundance change in the medium term and can the detected fluctuations and trends be attributed to wheather conditions or climate change?

Location: Quartz fields of the Knersvlakte, Succulent Karoo, South Afrika, a plant diversity hotspot.

Methods: We analysed trends in the regional climate in recent decades. Further, we monitored vascular plant composition and abundance of all taxa on 12 permanent plots (25 m^2) over a period of 12 years. With multiple regressions, we tested the effect of rainfall in different periods on species richness and abundance.

Results: The inter-annual variability of rainfall significantly increased by 0.48 mm per year for one of the stations. Annual maximum and mean temperatures increased by 1.2 K and 1.8 K, respectively, over a period of 46 years. The plots showed significant inter-annual changes in population size, species richness and species composition. In general, plant populations showed a significant positive trend over the 12 years analysed, while therophytes decreased significantly. Number of chamaephyte and geophyte individuals was positively influenced by rainfall of the preceding year, whereas therophytes were significantly positively influenced by rainfall of the same year.

Conclusions: We conclude that the increase in temperature and inter-annual variability of rainfall has so far no negative effects on the quartz field vegetation. However, according to projections there will be much stronger changes in temperature and rainfall patterns in the next decades. Continuous long-term monitoring of biodiversity is thus crucial to understand potential impacts of climate change in the Knersvlakte.

Lower Volga Valley Phytosociological Database

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The vegetation database of the Lower Volga Valley is created in Laboratory Phytocenology of Institute of Ecology of the Volga River Basin of Russian Academy of Sciences. The lower part of the Volga valley comprises two parts, namely, the Volga-Akhtuba flood-plain and the Volga delta. Traversing the arid Caspian Lowland, the valley of the Volga lower section is remarkable for a broad variety of vegetation. All available phytosociological relevés of different classes have been collected (*Charetea*, *Lemnetea*, *Ruppietea maritimae*, *Potametea*, *Phragmito-Magno-Caricetea*, *Isoeto-Nano-Juncetea*, *Crypsidetea aculeatae*, *Artemisietea lerchianae*, *Artemisietea tchernieviana*e, *Oryzetea sativae*, *Chenopodietea*, *Secaletea*, *Glycyrrhizetea glabrae*, *Molinio-Arrhenatheretea*, *Thero-Salicornietea strictae*, *Salicornietea fruticosae*, *Nerio-Tamaricetea*, *Salicetea purpureae*, *Querco-Fagetea*) and stored in a TurboVeg 2.79 database. Now, 9,659 of relevés are available in the database. The data are mainly used for classifications and studying of vegetation changes.

New Zealand's National Vegetation Survey Databank: improving access and interoperability

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The National Vegetation Survey (NVS) databank is New Zealand's primary archive for plot-based vegetation data and holds data from 77,000 relevés and over 19,000 permanent plots. The NVS databank provides a unique record, spanning more than 50 years, of indigenous and exotic plants in New Zealand's terrestrial ecosystems. A broad range of habitats are covered, with special emphasis on indigenous forests and grasslands. The databank is both an electronic database and physical archive, which stores field recorded plot sheets, maps, and photographs from over 1200 vegetation surveys. Data in the NVS databank has been built up over many decades by contributions from vegetation scientists and New Zealand environmental conservation agencies. The principal goals of the NVS databank are to provide a secure repository for such data and to ensure quality data are readily available to end-users in different organisations. A website (http://nvs.landcareresearch.co.nz) provides general background information, protocols for data deposit and use, and the ability to conduct online searches of metadata and to request data. Data within NVS have been used to support reporting requirements for the Convention on Biological Diversity, Framework Convention on Climate Change, NZ Resource Management Act, and the Montreal Process. They also assist in ecological restoration, and have been significant in enabling New Zealand to address issues of current concern that were unforeseen at the time of data collection. These include assessing the impacts of climate change and carbon storage in indigenous ecosystems. In 2007 a new extended and robust data model, based in part on the US VegBank design, was built and in 2009 a freely available data entry and analysis tool for vegetation plot data stored within the databank called 'NVS Express' was released. Future goals are to improve Internet services, develop additional online analysis and mapping capabilities, improve integration with plant trait data, and support the Veg-X data exchange schema.

Vegetation Survey of Namibia

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Agriculture provides a livelihood for roughly 70% of Namibia's population. Due to low rainfall in many parts of the country, the agricultural production system is mostly based on extensive livestock farming, using natural grazing as basis. A good knowledge of the natural vegetation is thus important for the sustainable utilisation of this resource. Initial work was conducted by Walter in the 1930's, Acocks in the late 1940's to early 1950's and Volk in 1956. Although very scantly distributed, these historic surveys can be well used to demonstrate long-term changes in the vegetation.

In the 1970's and 1980's, vegetation surveys were conducted in several of the nature reserves of the country for planning purposes. However, for the farming areas, no comprehensive vegetation survey was ever attempted until after independence. The Vegetation Survey of Namibia is undertaken by the National Botanical Research Institute, with contributions and support from various programmes like BIOTA, Deserts Margins Project (DMP), ACACIA, NOLIDEP, various Environmental Impact Assessments, the Inselberg Project and various smaller research initiatives.

Threats to the Namibian vegetation include Global Climate Change and Human land use. Here the most prominent threats include deforestation for the purpose of creating crop fields and plantations (including biofuel plantations), overgrazing and over-utilisation, and to a lesser extend (area-wise) infrastructure development and mining. The few historic surveys are long-term indicators of the change our vegetation has gone through, whilst the (relative) recent data can be used as a baseline for future monitoring.

Population dynamics of *Balanites aegyptiaca* and *Acacia seyal* in the Sub-Sahel of Burkina Faso

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In Burkina Faso, woody plants play an integral part of livelihood strategies for rural people, providing fruit, fodder, firewood, timber, traditional pharmaceutical products and many other products that are used locally or sold for monetary income (Ræbild et al. 2007). Increasing population and livestock intensifies pressure on forest resources on which more than 80% of the population depends.

Many studies have reported a continuous decrease of woody species due to human exploitation. However, for most of the species, there is a lack of long-term monitoring data on population trends. Diameter Size class distribution (SCD) has shown to be a useful tool to assess and predict population structure of harvested species.

Using the method of SCD (Condit et al. 1998), we studied the dynamic of *Acacia seyal* and *Balanites aegyptiaca*, two multipurpose woody species that are heavily used in the Sahelian area of Burkina Faso.

The regression of the SCD for both species showed a significant ($p < 0.001$) negative SCD slopes, indicating of a reverse J-shape that characterize species with stable population structure and a good regeneration.

Vegetation plot data and databases of the grassland communities in Anatolia

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Turkey has approximately 20,000 relevés. There is no any central database for Turkish vegetation relevés. That is first application to build database of the Turkish vegetation relevés. The study was based on the grassland vegetation database only at the Anatolia from published and unpublished data. These data contains dune, steppic, alpine and subalpine grassland vegetation. Approximately 600 relevés entered to TURBOVEG program. Also indicated georeferencing code by using Google Earth program that integrated to TURBOVEG program. Available header data used at the dataset. The quality of the data is discussed, such as researcher bias, preferential selection of sampling sites, spatial autocorrelation. Most of the relevés belong to the classes *Astragalo-Brometea* and *Daphno-Festucetea*.

The national relevé database of Ukraine – structure, features and functioning

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The National relevé database of Ukraine was established at 1996. The database extension is provided by adding relieves from published sources. The database consists of ca. 10,000 relevés, which corresponds to 25–35% of overall published quantity. Relevés belongs to more than 900 associations and 70 classes. All Ukrainian vegetation types are present in database.

Range expansion of *Ceratocapnos claviculata*: community composition and habitat quality in the native and the invaded range

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The eu-atlantic forest species *Ceratocapnos claviculata* (L.) Lidén showed an increase in frequency within its range and a rapid range expansion east- and northwards into sub-continental and north-temperate regions during the last decades.

In order to evaluate the role of factors such as direct anthropogenic impacts, increased atmospheric nitrogen depositions and climate for the distribution and present range expansion we addressed the following objectives: (i) to compare community composition across the entire range, (ii) to test whether abundance of *C. claviculata* and community composition of mixed oak forests in the old range (relevés from the Dutch Landelijke Database) varied between the periods “before 1970” and “1990–2006” and (iii) to compare community composition, habitat quality and fitness of the species between the former and the invaded range.

We used information from various vegetation databases to obtain vegetation relevés across the complete original range and own vegetation surveys and population biological data from three regions of which one was situated in the old (NW Germany) and two situated in the invaded range (NE Germany and Sweden).

NMDS ordination of releves from the entire range assigned to five climatic zones showed a separation into three main groups. Relevés of the central-atlantic zone, representing typical elements of the European flora, were scattered across the entire ordination space.

A comparison of old and new Dutch relevés revealed significant differences between the two groups due to a decrease of species diversity and an increase of nutrient indicators, neophytic and hemerobic species in new relevés. However, abundance of *C. claviculata* did not change between the time periods considered.

There were larger floristic differences between the two regions of the new range than between old and new range sites. Thus there were no generalizable differences in community composition between the former and the extended range. However, fitness parameters and indicator values for temperature, nutrients and moisture showed significant differences between former and invaded range.

Plant species responses to climate variables

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Climate change will force plant species to react; they can stay and adapt, disperse at a rate so they can match the climate change 'speed', or they will, in term, become extinct. Effects of climate change are not limited to temperature raise alone, but e.g. also affect precipitation. Knowledge on the responses and preferences of plant species to temperature and precipitation can help to understand better species response to climate change and may identify species that are under threat, though at presents there are no signs yet that they are endangered due to climate change.

We used our earlier developed method to estimate plant species responses for soil variables to estimate plant species response to climate variables. Responses were estimated for temperature (annual mean, average highest en lowest temperature) and precipitation (yearly total and growing season total). Responses were estimated on a European scale, combining vegetation relevés, climatic information from weather stations and an altitude map from Europe. We extrapolated the climatic information using the altitude map to estimate the temperatures and rainfall at the sites the relevés were made. This resulted in responses to climatic variables for many European plant species. The responses will undergo further testing on their reliability and we will be made available through the website www.abiotic.wur.nl.

Plant trait response to livestock grazing across habitats and years in a semi-arid African savanna

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Introduction: Exploring the relation between species traits and the environment facilitates general statements beyond taxonomic levels about the response of organisms to environmental constraints. Traits are necessary generalisations to build predictive models of the response of ecological communities to environmental changes. In a semi-arid African savanna we tested the responsiveness of a choice of different whole-plant, leaf and regenerative traits to livestock grazing. As naturally occurring grazing gradients we used piospheres, i.e. zones of animal impact around livestock watering points.

Methods: At a regional scale, vegetation composition, environmental parameters and plant traits were sampled within piospheres, on differently managed farms in different habitat types and two different years. To separate the influence of grazing from other environmental variation caused by, e.g. different habitat types we applied a partial direct approach to analyse the trait-environment relation, called partial RLQ. RLQ is an ordination technique (Dolédec et al. 1996) relating a matrix of environmental variables by samples to a species-by-traits matrix using a species-abundance-by-samples matrix as a link. To test the relation between single traits and environmental variables we applied the fourth corner statistic (Dray & Legendre 2008).

Results: The partial approach removed confounding environmental variation caused by the sampling in different habitats and years. As result, grazing related environmental variables as distance from water point, dung cover, soil pH and conductivity were the most influential regarding the trait distribution along the RLQ axes. Long leaves, belowground clonality, perennial life cycle, anemochory, leafy stems and entire leave blades showed a significant negative relation to increased grazing pressure. The traits prostrate-creeping habit, compound leaves, herbaceous growth form, annual life cycle, no clonality, high specific leaf area (SLA) and zoochory were positively associated with high grazing pressure.

Conclusions: Our results indicate that even at a regional level the analysis of the relation of plant traits to a certain ecological driver like livestock grazing can be confounded by local environmental variation like, e.g. soil condition. For trait analyses on a large spatial scale we would therefore recommend a step including the partialling out of confounding environmental variation. Traits responding negatively or positively to grazing pressure are to a large extent consistent with those grazing response traits found in other studies and could be related to life history, growth and regeneration.

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The Flemish vegetation database, Vlavedat (Flanders, Belgium).

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The Flemish central vegetation database, Vlavedat was launched in 1999, set up and initially designed for the project "Towards a systematic of the Flemisch nature types" (1999–2002). For this purpose - framing a first typology of the nature types occuring in Flanders- we started with the description of the best direct perceptible characteristics, the observed vegetation. In this context the necessity raised to centralize and digitalize all available phytosociological relevés: vegetation data from published papers (articles, monographs, books) and various unpublished sources (master, doctoral and "candidate of science" theses in botanical sciences, essays, reports, botanists field notebooks) were computerized using Turboveg (Hennekens 1994) in one central data bank, Vlavedat. This Flemish central vegetation database is hosted at the Research Institute for Nature and Forest (INBO), a scientific institute of the Flemish Government in Belgium:

http://www.inbo.be/content/page.asp?pid=BIO_NT_vlavedat

At the end of the "Flemisch Nature types" project, in 2002, Vlavedat counted more than 25.000 relevés done by 130 authors (plus anonymous sources), coming from 1675 locations. Nor the geographical, nor the ecological, nor the syntaxonomical spreads of the plots were uniform over Flanders. The provisional typology of the Flemisch nature types contains 12 reports (in Dutch) covering 12 biotopes groups; a global synthesis is to be done http://www.inbo.be/content/page.asp?pid=BIO_NT_start. Since then the capture is ongoing, depending on the dynamic of (feeding) projects. These are mostly thematic related researches (f.e. typology of running and standing waters, typology and management of graslands, ecohydrological sensitive vegetations) and/or studies at regional level (f.e. Schelde, Kempen, Coast). Recently, according to the European Habitat Directive (92/43/EEC), especially in order to assess the conservation status of the Natura 2000 habitats (implementation of the six yearly reporting obligation) new monitoring schemes are to be set up and consequently related Natura 2000 vegetation datasets emerge.

Currently more than 40,000 relevés are both computerized and stored in Vlavedat (Schaminée et al., 2009). At the moment the database is only available upon request to participating researchers for the purpose of various projects, non-commercial use by the scientific community in Flanders and abroad.

Plant invasion database of Taiwan

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To generate better understanding of composition, distribution, and impact of plant invasions in Taiwan, a four-year nationwide investigation on naturalized/invasive plants sponsored by Forest Bureau, Taiwan, has been launched in 2009. Databases and a website of plant invasions in Taiwan have been established as well to accommodate field data of species, environmental factors and statistical summaries of up-to-date situation in the fields. A stratified random sample of 1,080 plots (1 km^2 each), representing 3% of the total area of Taiwan will be surveyed systematically. For each plot, species and cover of both of native and naturalized species are recorded according to classified habitat types in each plot. The investigation has been implemented in the coastal and lowland regions this year, and it will move toward the central high mountains progressively in the following three years. With this comprehensive datasets of coexisted native and naturalized species in each habitat type, we hope to generate ecological models for impact assessment, prediction of further invasion, and relationship between native and naturalized species under global warming and climate change. Up to the end of 2009, floristic investigation of 289 plots along the coastal region has been completed and the data have been uploaded onto the database.

How to analyse data with spatial autocorrelation?

Wednesday, 9:30–18:00

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BIOTA Base (Software): exploring an alternative solution for the storage of large vegetation datasets

Wednesday, 14:00–18:00

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In this workshop we will present the structure and performance of the vegetation database software BIOTABase. The aim of the workshop is an introduction into data handling with BIOTABase. We will explore the basic database structures using test data sets, create a new database, use reporting and analysis tools and look at data export. Handling of monitoring data (time series) and nested plots will be explained. A final focus will be set on the interoperability with ArcGIS® and Juice. The workshop will enable participants to use the software for their own projects.

Background: The vegetation database software BIOTABase has been developed to cope with the structured storage of vegetation monitoring data and related environmental data. The need for this emerged from the biodiversity long-term monitoring project BIOTA AFRICA. The database architecture facilitates specific environmental monitoring requirements like the handling of time series, nested and individual-based monitoring plots. Interoperability with geographic information systems as ArcGIS® and global data sets as FAO SOTER allows thorough analyses of spatial pattern in large datasets. The software facilitates direct linkages between observation data, collection data and reference data on taxa.

BIOTABase is a scientific freeware and can be downloaded at

http://www.biota-africa.org/download_soft_ba.php?Page_ID=L900

R Workshop I: multivariate vegetation analyses and ordination methods

Friday, 14:00–18:00

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Multivariate analyses are the bread-and-butter business of vegetation science. Nevertheless due to software limitations, used methods often depend more on available software and software skills than on sound theoretical considerations. I do not want to dive into too much details within a 4 hours crash course, but rather show the advantages of a software environment that is able to conduct all kinds of analyses with only a few lines of code in parallel. We will use artificial as well as real datasets from different sources to exemplify the use of R as well as advantages and disadvantages of different methods for analyses.

R Workshop II: handling spatial data

Friday, 14:00 – Saturday, 13:00

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On Friday the content will be more or less the same than in Workshop I. On Saturday we will focus on spatial data. Ecological datasets commonly hold a great amount of spatial information. Spatial information, e.g. vegetation plot coordinates, mapped plant individuals etc. show patterns that can be analysed or visualised in numerous ways. This practical deals with the handling of spatial information within the R-software environment. We will look at different ways to import and export point data from databases, creating shape files, projecting and transforming coordinate systems, loading raster datasets (DEM, satellite imagery) and combining these parts into a spatial analysis. Finally, our results will be converted to a KML file which allows a simple Google Earth image overlay.

SE European Dry Grassland Vegetation Database: kick-off workshop

Saturday, 10:00 – Monday, 18:00

Jürgen Dengler[1,2]

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Aim of this workshop is to lay the fundaments for a supranational TURBOVEG vegetation database of dry grasslands (and related communities) in Southeast Europe. As SE Europe we consider the countries Bulgaria, Romania, Moldova, and Ukraine, but we are open to extent the coverage westwards if colleagues from countries such as Macedonia, Serbia, Hungary, or Slovakia wish to join.

During the workshop, we will:

- Settle criteria for the inclusion relevés
- Compile an overview of existing relevés (digital or not) and databases
- Decide about the organization (structure, people, institutions, responsibilities, copyright) of the database
- Decide about a joint set of header data and a uniform species list
- Plan the future capturing of data
- Discuss possible first publication projects based on analyses of the data

Most likely, the workshop will also result in the establishment of a SE European subgroup of the European Dry Grassland Group (EDGG, www.edgg.org).

All colleagues from the named countries who are interested in establishing and maintaining such a database are welcome. In addition, we appreciate the participation from colleagues from outside SE Europe who have relevant relevé data or particular research interests in SE Europe.

The workshop will start on Friday noon and continue the whole weekend until Monday evening. However, we will also include half a day of sightseeing on Sunday. Participants from SE European countries are exempt from the conference fee and they can apply for financial support to their travel expenses, provided they give a poster presentation during the main conference on Thursday. Upon request, we also can also arrange private, cost-free accommodation with members of our Working Group for them.

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K = keynote lecture; T = talk, P = poster; W = workshop; presenters are in **bold**.