

20th International Workshop of European Vegetation Survey



Roma, April 6th - 9th 2011

A CENTURY OF PHYTOSOCIOLOGY & 20 YEARS OF THE NEW SPIRIT IN PHYTOSOCIOLOGY

In collaboration with the "Circumboreal Vegetation Mapping Group"





BOOK OF ABSTRACTS



ABSTRACTS

20th EVS Workshop ROMA, April 6th-9th 2011

"ORIGINAL AIMS REVISITED: VEGETATION SURVEY, DATA ANALYSIS & INFORMATION SYSTEMS, APPLICATIONS"

"BOREAL VEGETATION"

In collaboration with the "CIRCUMBOREAL VEGETATION MAPPING GROUP"

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DYNAMICS OF PLANT SPECIES IN INITIAL MESOPHILOUS MEADOWS OF CENTRAL EUROPE – RESULTS AND EXPERIENCES SOME YEARS AFTER RESTORATION BY HAY TRANSFER

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One of the most effective and cheapest methods to restore or create species-rich meadows is the transfer of freshly cut grass ('hay transfer') from donor meadows to recipient areas that had been used before as arable field or intensively managed grassland. In Central Europe this restoration method has been applied many times to rather wet or dry grasslands (*Calthion, Molinion, Mesobromion*), but hardly to mesophilous ones (*Arrhenatherion, Trisetion, Cynosurion*).

Since 2004 we study the success of 23 hay transfer measures in SW- and NW-Germany and the population dynamics of mesophilous grassland vegetation and its characteristic plant species. Two years after the measures we found a great variety in the number of all established species from 1 to 53 (medium 20), as well in the number of the established grassland species. In the same way the transfer rates extend from 18% to 79% (medium 53%). From 210 plant species occurring in the donor meadows, 109 species (52%) were not transferred, while 25 species (12%) showed a (very) low transfer rate (1-40%), 15 species (7%) a medium rate, and 34 species (16%) a (very) high rate; 27 species (13%) were able to establish completely in the recipient areas. Most characteristic and widely distributed species of mesophilous grassland types as Centaurea jacea, Festuca pratensis and Festuca rubra, Poa trivialis, Galium album and many others show high transfer rates or even established in each restoration area. The lacking or low establishment of a great number of species might be caused by (1) their low frequency and/or abundance in the donor areas, (2) low germination rates and/or (3) their low competitive strength in the slowly closing herb layer; furthermore, (4) 62 of them are not considered as typical species of fresh grassland habitats (but typical in stands of *Caricion davallianae*, *Filipendulion*, Phragmition, Brometalia/Xerobromion and similar alliances, or being ruderals or weeds of arable fields etc.), and/or they flower and form seeds before or after the hay transfer period (that is from mid of june to end of july).

At the Tüllinger Berg near Basel, three meadows were restored from arable fields in 2004. We observed an exponential increase of the established species (all and grassland species) in the first two years (2005 and 2006), while this number increased slowly in 2006 – 2008 and was more or less constant in the following years. Before the hay transfer (2004) we found only 4 grassland species in the abandoned fields, but this number 'exploded' to 15 (2005) and 24 (2006) up to 32 (2008); according to this, the number of non-grassland species strongly decreased from 10 (2004) to 2 (2008). In the same way, the spectrum of dominant species changed from year to year: Before the measure (2004) Chenopodium album, Convolvulus arvensis and Elymus repens showed highest cover degrees, but two years later the aspect was dominated by Rhinanthus alectorolophus, Dactylis glomerata, Arrhenatherum elatius, Festuca rubra and Medicago lupulina, transforming in 2008 to the dominance of Bromus erectus, Helictotrichon pubescens, Trifolium pratense and others. We conclude that most of the establishment processes occur in the first 3-4 years after restoration measure, but the processes of establishing as well as vanishing of single species as well as the strong evolution of the dominance spectra continues in the following years.

REED DIE-BACK IN CENTRAL ITALY: PLANT TRAITS, ENVIRONMENTAL FEATURES AND IMPLICATIONS FOR THE VEGETATION

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Common reed die-back, a well known phenomenon in Central Europe, was recently detected in the Mediterranean Basin at Lake Trasimeno, one of the largest freshwater ecosystems in Central Italy. The symptoms of decline were analysed by using a large set of parameters including morphologic, phenologic, anatomical, cyto-histological and histochemical traits; fungal endophytes in reed leaves and roots were investigated too. Stem height and diameter, node number, growth rate, lateral root diameter and amount, clumped habit resulted the most significant morphologic factors highlighting the declining condition. A correlation between the presence of starch in roots and rhizomes and the die-back syndrome was confirmed. With regards to fungal endophytes, one of the dominant taxa in the most declining reed stands appeared to belong to a species complex that produces mycotoxins affecting the host plant health. All the investigated traits contributed to point out the features of the reed decline in the study area. Some environmental characteristics of the reed stands were also taken into account; among them, the period of submersion and the presence of standing litter emerged as important features, related to the degree of decline in the population. Finally, floristic and vegetational traits of declining and healty reed stands have been taken into account and analysed from a phytosociological point of view. Results show that Phragmites australis tends to form monospecific stands in permanently flooded areas rich in organic deposits and autogenous standing litter, where the symptoms of reed decline seem to be more severe. Species rich stands develop in terrestrial areas, on nutrient-rich soils, where reed shows vigorous growth and healthy condition; however, the observed floristic richness is mostly due to invasive and nitrophylous species from the classes Stellarietea mediae Tuxen et al. ex von Rochow 1951 and Artemisietea vulgaris Lohmeyer et al. ex von Rochow 1951, which give rise to a pseudo-reed bed, lacking in typical palustrine species. The results draw attention to the risk of loss of an ecosystem which plays an important role in biodiversity conservation.

FOR A SURVEY OF THE ITALIAN SYNTAXA

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Syntaxonomy might be a powerful tool for comparisons in descriptive biogeography, provided a consistent structure in the floristic assessment of the units, along with a regional and continental consensus about their classification.

Nevertheless many issues are still far from a general acceptance at a reasonable geographical scale. In Italy different alternative syntaxonomical schemes are the object of ongoing debate among scholars. Proposals for new classifications produce an additional increase of the described syntaxa magnificating mismatches, when revisions do not encompass whole units within a sufficiently large range

Here an annotated synopsis of higher rank syntaxa recognized in the Italian vegetation is presented.

Priority is given to a diagnosis emphasizing the functional and phytogeograpical distinctiveness of the syntaxa.

The goal is to produce a national overview listing syntaxa rather recruited on the basis of their adherence to the structure of zonal biomes than by the mere observance to the selection imposed by the Code.

SYNBIOSYS FYNBOS - APPLYING ECO-INFORMATICS IN VEGETATION AND LANDSCAPE MANAGEMENT

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The rapid developments in computer techniques and the increasing availability of large datasets have resulted in new perspectives for vegetation research, aiming at a better understanding of the ecology and functioning of ecosystems, underlying mechanisms and their setting in the landscape. Information systems prove to be a helpful tool in this new research field, called eco-informatics. Such information systems may integrate different biological levels: species, community and landscape. They incorporate a GIS platform for the visualization of the various layers of information, enabling the analysis of patterns which relate the individual levels. An example of such an information system is SynBioSys Fynbos, dealing with the biodiversity of the South African fynbos biome, one of the hottest hotspots in the world, comparable with tropical rainforests. This project was initiated by the Dutch Embassy in Pretoria, as the fynbos ecosystems are threatened by urban expansion, agricultural transformation, invasive species and climate change, among others. A small area gives room to more than 9,000 plant species, of which some 5,000 endemics. On the species level, ecological and distribution data of the South African National Biodiversity Institute are made available. So-called Turboveq databases form a basis for the community level and data from the recently published Vegetation map of South Africa, by Mucina and Rutherford, for the landscape level. With regard to the fynbos vegetation, more than 3,000 relevés from literature and personal archives have been brought together. In separate sections, multimedia and literature can be consulted. In close collaboration with the NGO's Environmental Monitoring Group (EMG) and Indigo Development & Change, a module has been developed on the ecology and sustainable harvesting of Wild rooibos (Aspalathus linearis), a well-known source for a South African herbal tea. The final version of this module was launched at a workshop in Cape Town last November.

QUANTIFYING THE EFFECTS OF DISTURBANCE FACTORS ON HABITAT AND NATURALNESS OF COASTAL DUNES

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The effects of disturbance factors on habitats and naturalness of coastal dunes of the Tyrrhenian coast of Central Italy was investigated. 365 vegetation releves carried out along 165 transects laying perpendicularly the shoreline were used to identified the main habitats by means of TWISPAN classification and Detrended Correspondence Analysis. Multiple correspondence analysis (MCA) was applied in order to analyse the effects of disturbance factors on the presence of the identified habitats. ANOVA was used to investigate the effect of single and combined disturbance factors on the naturalness measured with H_{DUNE}, a modified version of the Shannon index, that takes into account both richness and degree of cover of plant species. Four habitats were identified along a sequence starting from the shoreline: 1-annual vegetation on drift lines with Cakile maritima; 2-embryonic shifting dunes with Elymus farctus; 3-shifting dunes with Ammophila arenaria; 4therophitic back dune grasslands with Ononis variegata. MCA showed that disturbance factors including erosion, beach tourism, trampling, mechanical cleaning and bathing establishments have a differential and differentiated (positive, negative and neutral) effects on these habitats. The same occurs when analysing the effects of these factors on H_{DUNE} , even though the overall combined effects was negative due to mainly erosion and to the integrated effect of mechanical cleaning and bathing establishments. The method based on transects, saving cost and time of sampling effort and being repeatable, allows the comparison among coastal areas in terms of conservation status and priorities and it can be used for monitoring coastal dune ecosystems over time and for assessing the effects of management actions. In particular, the results are useful for elaborating conservation strategies when focused on a single habitat or on the overall plant diversity of dune system.

VERY HIGH SPECIES RICHNESS IN HEMIBOREAL FORESTS OF THE NORTHERN RUSSIAN ALTAI, SOUTHERN SIBERIA

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We discovered forests with exceptionally high species richness in the northern Russian Altai. The richest forests that we sampled in the valleys of the Katun' river tributaries contained 45 species of vascular plants per 1 m², 82 per 10 m², 114 per 100 m², and 149 per 1000 m². We did not find any records of higher species richness for temperate or boreal forests in the Eurasian literature.

These forests occur in an area with mean January temperature of -12.5 to -10°C, mean July temperature of 16-18°C, and annual precipitation of 560-610 mm, on moderately deep soils with pH(H₂O) 6.2-7.3. They have a species-poor, open canopy (cover 30-50%) dominated by *Pinus sylvestris*, with an admixture of *Betula pendula*. Their herb layer consists of a rich mixture of forest, steppe and meadow species. Shrub and moss layers are sparse. In comparison with species-poorer forests of the Altai Mts, these forests tend to occur in warmer areas with intermediate precipitation and on deeper soils with higher pH.

Possible explanation of this high species richness is a peculiar combination of local site factors, landscape context and historical processes conducive to high diversity. These sites represent intermediate parts of the main environmental gradients, which support coexistence of species requiring high levels of particular factors with those adapted to low levels: (1) open canopy provides light levels suitable for both grassland and woodland species; (2) mesic soils are suitable for both steppe species and those of forests and wet meadows; (3) near-neutral soil pH is optimal for most species of the local flora. In addition, these forests occur in a hilly landscape with a heterogeneous mosaic of forests on north-facing slopes, steppes on south-facing slopes, and moisture-demanding vegetation on the valley bottoms. In such landscape species of open habitats spread to the adjacent patches of open-canopy forests due to spatial mass effect. Finally, vegetation of the Altai Mts is historically very stable since the Pleistocene: long-term species accumulation coupled with limited extinction under relatively stable environment probably led to formation of large species pools.

PROGRESS TOWARD A CIRCUMBOREAL VEGETATION MAP (CBVM) EMPHASIZING BOREAL NORTH AMERICA

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The aim of the CBVM project is to produce a vegetation map at a scale of 1:7.5 million with geobotanical database and derived products of the entire boreal biome using a unified international method for classifying and mapping boreal vegetation. The map will provide a common legend and language for the various ecosystems that make up the boreal region with a consistent treatment for the vegetation through legend descriptions, photographs, lists of major vegetation types, and supplementary maps. Although there are a number of useful remote-sensing products displaying vast areas of the north, we intend to develop a true vegetation map such as the one produced for Europe under the leadership of Udo Bohn. Our primary rationale is that global-scale boreal research programs, modelling efforts, educational materials, and conservation efforts require a common language for describing boreal ecosystems. The basic map units will be physiognomic and/or a combination of physiognomic-floristic units. The internationally recognized Braun-Blanquet plant-community nomenclatural system, or the closest equivalent that can be provided, is a logical choice as the preferred foundation for cataloging plant communities. Boreal forests are particularly appropriate for unified classification because of their high level of floristic, physiognomic, and syntaxonomic similarity across the entire biome. The map can serve as a key component of circumboreal geographical information systems (GIS), and such a map is needed for resource development, land-use planning, studies of boreal biota and biodiversity, education, anticipated global changes, and human interactions. Documenting the current distribution of the boreal is a first step toward monitoring these long-term changes. The project is endorsed by the Conservation of Arctic Flora and (Fauna) program, International Arctic Science Committee (IASC), and by the Senior Arctic Officials representing the eight Arctic States. Since 2008, we have convened six international CBVM workshops in Canada, Faroe Islands, Finland (2), Sweden, and Iceland with focus on developing a legend. Representative portions of the boreal were evaluated in 2010 as prototype maps to test a draft legend and mapping protocols. In late January 2011, the CBVM team met in Akureyri, Iceland to synthesize the legend using results from the prototype maps. Our presentation will provide a status report for the CBVM project, including a summary of the outcomes of the Akureyri workshop.

WHICH ECOSYSTEM FEEDBACKS ARE STORED IN HUMUS?

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Vegetation and climate play an important role in the humus genesis. Humus properties, on the other hand affect dynamically the ecosystem capacity following a feedback process. Humus genesis nevertheless is a long time-responsive process and it is assumed that in presence of short term ecosystem changes humus maintains a steady state. Taking into account this homeostasis potential of humus, this research aims to explore the correspondences between vegetation and humus forms. A study on these relationships was initially carried out in beech forest of central Apennines. The data set obtained was successively extended with data from the lowland mixed oak forest (Castelporziano Reserve, Latium) in order to compare the response of species and communities in the two kinds of ecosystems. Ellenberg's indicator values were used to test the relationships between vegetation and humus. In particular, the product mR x mN, which in literature has already been associated to humus quality, showed a reliable relationship with the vegetation in mixed oak forest: the different plant communities are well distributed along the range values of mR x mN, and to a lesser extend to the corresponding humus forms. In beech forest the range of the humus forms was found to be smaller. In both ecosystems mR x mN is highly and significantly correlated with the soil moisture indicator. Species show an inverse pattern in the two habitats: in beech forest character species of *Polysticho-Fagetum* are associated with humus forms, while in the lowland oak forest only few dominant species were recognizable as indicators of different humus forms. This could be the effect of high anthropogenic disturbance due to wild herbivores heavy rooting and grazing affecting the species assemblage of the understory.

THE SARDINIAN NATURE MAP A TOOL FOR CONSERVATION AND MANAGEMENT OF HABITATS

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The Sardinian Nature Map has been realized (1:50.000 scale) based on the CORINE biotopes manual, with the correspondence to the classification systems of EUNIS and Nature 2000. In several cases, the kind of habitat description is generically given on a wide geografic base and the total identity at regional range is often not so easy. In other cases, the need to maintain a unified framework at European Union level has suggested that a further habitat fragmentation could make the comparison even more complex. As is known, the CORINE code is characterized by plant associations and Sardinia, while presenting well known areas (e.g coastal areas, lagoons, Gennargentu, central-estern limestone areas, Sulcis and Nurra regions) to get a fully comparison, in many areas, detailed studies still need. The used methodology is that proposed by ISPRA adopted at national level. About 6.000 ground points control, to verify the main types of vegetation and to highlight the specificities of different areas, have been checked in the 24.000 sq km of the Island, in order to identify the Sardinian habitats. Then, an analysis was made for each one and a comparison with the CORINE legend, emphasizing if it exists: a) a perfect matching, such as in the case of habitats which have the geographic reference in Sardinia; b) a substantial correspondence even in the absence of a specific geographic reference; c) conditions of low diversity compared to the legend and code of ISPRA or CORINE manuals; d) conditions of significant differences from those described in the manuals, but maintaining, in this case, the reference code; e) new identified habitats that still deserve to be reported both for their extension or their importance from the environmental point of view, regardless of the area surface. The research identifies about 250 habitats or complex of habitats and gives an original description, outlining the characteristics actually verified in the field and, for 93 of them, the area occupied by each one. The study showed about 80 DH habitats with about 20 priority, highlighting the species of interest, the state of conservation and the issues related to the impacts and protection.

THE *QUERCO-FAGETEA* CLASS IN SICILY: AN EXAMPLE OF BOREAL-TEMPERATE VEGETATION IN THE CENTRAL MEDITERRANEAN AREA

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In the frame of phytosociological investigations on the woody vegetation of Sicily, the mesophilous plant communities belonging to the Querco-Fagetea class are examined. This vegetation represents in Sicily an outstanding example of borealtemperate vegetation, which is floristically characterized not only by the occurrence of a rich pool of Euro-Siberian taxa, but also by some endemic species whose distribution range is circumscribed to the central-southern Apennines and Sicily. The Temperate floristic elements reached the southernmost Mediterranean territories during the late glacial period, thus getting in contact with the Mediterranean flora which was already established in these areas. In particular, Fagus sylvatica, together with other mesophilous temperate species, colonized those environments which originally hosted conifers-dominated woodlands. Some remarkable relic examples of these Tertiary woody vegetation are still surviving in the highest mountains of southern Spain, northern Africa, Peloponnisos, Crete, Cyprus, southern Anatolia, and Lebanon. As a consequence of the penetration of these two floristic elements, whose origin is completely different, the Sicilian woody vegetation of Querco-Fagetea class is represented by several peculiar plant communities, mostly exclusive of the island. Actually, such mesophilous woodlands are only found on the Madonie, Nebrodi, Peloritani, and Etna, and they can be ascribed to two different orders: Fagetalia sylvaticae and Quercetalia pubescentipetraeae. The first order is represented by the alliance Geranio versicoloris-Fagion sylvaticae, which chiefly groups beech-woods or, more rarely, yew-, durmast- and Turkey oak woods. The second order, which seems to be less mesophilous, is represented by the sole alliance Pino-Quercion congestae, including deciduous oakwoods, chestnut-, aspen-, pine-, and birch-woods.

BOREAL FOREST VEGETATION OF EUROPEAN RUSSIA AND ITS MAPPING

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The first step of the European Russia boreal vegetation mapping at scale 1:7 500000 (as a part of the Circumboreal Vegetation Map) was the study of previous vegetation maps and published data concerning the vegetation units. The differences between the forest associations occurring in different subzones of the Boreal zone were found out for climax communities, serial vegetation of paludified forests, and fire-dependent pine forests on sandy and rocky sites. To avoid the uncertainty of the dynamical state of the vegetation that we intend to show on the map we proposed the classification of the dynamical state of the vegetation units and suggested the determination of the dynamical units to be shown on the CBVM: 1) the natural pristine vegetation and the reconstructed natural vegetation on the place of disturbed vegetation on the irreversibly modified sites, 2) the natural vegetation periodically disturbed by the natural factors (impulsively sustainable, sub-climax such as pine forests on sandy and rocky sites), 3) the actual aquatic sites of the artificial ponds (showing the actual hydrographic situation), 4) the potential forest and mire vegetation on the place of drained lakes, 5) the reconstructed natural vegetation on the sites having been irreversibly modified by mining, peat excavation, roads, settlements (except the sites transformed into reservoirs). The comparison of the vegetation maps and the forest inventory data showed that on the vegetation maps the area of sub-climax pine forests on the extremely drained sands was overstated. The area of Oxalis-type was also overstated in some landscapes. On the analyzed maps all the areas with the predominance of pine forests were shown as a potentially pine forests. However our investigations showed that the most part of these pine forests were the stages of secondary successions after the disturbances and they could be replaced by the spruce climax forests.

RAISED BOG VEGETATION CHANGE IN THE LIFE PROJECT SITES IN LATVIA

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Raised bog vegetation was studied in the especially protected nature areas in Latvia-Cena Mire, Stikli Mires and Klani Mires Nature Reserves. The sites are nationally and internationally important and include intact raised bog vegetation. The mire margins are influenced by drainage and peat extraction. To stop the desiccation of the valuable raised bog habitats management actions were carried in the study sites. Before and after rising of the water level in the study site sites, vegetation and hydrological monitoring was carried out. In 2005 permanent plots were established next to hydrological monitoring plots, in places where vegetation changes are most likely to occur before the planned management actions take place in 2006. There are 38 monitoring plots on ditches in the raised bogs, twenty monitoring plots in raised bogs (7110*, 7120) and 4 monitoring plots in transitional mire (7140). Monitoring scheme includes also control plots. The wetness of the sites was recorded and includes surface water evaluation; identification of adjacent pools and Sphagnum dominated vegetation. In total there are 130 vegetation monitoring plots. Since 2010 vegetation studies were started in the EC LIFE Project Restoration of Raised Bog Habitats in the Especially Protected Nature Areas of Latvia. Field studies as well as vegetation monitoring was started in 4 raised bogs -Melnais Lake Mire, Aizkraukle Mire and Forests, Aklais Mire and Rozu Mire which in addition to mire vegetation includes also diverse forest and lake habitats.

THE BIOCLIMATICAL APPROACH AS AN ESSENTIAL TOOL FOR THE CIRCUMBOREAL VEGETATION MAPPING (CBVM) PROJECT: THE CASE OF THE BOREAL VEGETATION SERIES OF NORTH AMERICA

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The bioclimatical approach follows the premises and concepts made by the Bioclimatology as a geobotanical science. This approach combines climatic parameters with biological factors specifically vegetation, to obtain some characteristic environment features called bioclimatic indexes, whose combined invariably characterize specific territories occupied by a specific vegetation series. That is the case of the Boreal macrobioclimate in North America. The potential territory is framed north by the polar (arctic) area and south by the Temperate macrobioclimate. Biogeography, bioclimates (thermotypes and ombrotypes), and continentality make possible a high diversity of boreal vegetation which in their mature dynamical stages is always represented by a conifer forest vegetation structured by trees. The potential vegetation (climatical conifer forests in its mature stage) is included in two well-differentiated phytosociological classes: Linnaeo americanae-Piceetea marianae, and Tsugetea mertensiano-heterophyllae. We present in this contribution a synthesis on Boreal macrobioclimate in North America and the checklist of the boreal vegetation series recognized throughout the North American territories including their full geobotanical diagnosis and their syntaxonomical scheme. This synthesis should be very useful for the bioclimatic framework adopted by the Circumboreal Vegetation Mapping (CBVM) Project.

PHYTOSOCIOLOGICAL AND ECOLOGICAL STUDIES OF HIGH ALPINE TO SUBNIVAL SCREE VEGETATIONS OF N AND NW OF IRAN (ALBORZ AND AZARBAYJAN MTS.)

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Iran is a mountainous country with a fragmented high alpine and subnival-nival zone across the Iranian mountains. In this work a syntaxonomic and synecological survey is presented on the flora and vegetation of high alpine and subnival-nival scree vegetation of Alborz and Azarbayjan mountains in N and NW of Iran. 145 phytosociological relevés have been collected from scree vegetation types which are altitudinally concentrated between 3400-4500 m of the study area. By means of phytosociological classification and ordination, the plant communities and environmental factors are analyzed. All high alpine and subnival scree plant communities are initially arranged in one class, two orders, four alliances and 17 associations. The altitude, slope and edaphic qualities are more important for species composition and vegetation mosaic. The high rate of endemism with a narrow geographical distribution makes the flora and vegetation of these areas vulnerable to climate warming. The narrow altitudinal and geographical distribution of most of species of these vegetation types and the low potential of alternative cold habitats render them highly vulnerable to climate change.

VEGETATION OF GREENLAND

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The status of vegetation knowledge of Greenland and the Arctic are reviewed. Diagnostic species, distribution and ecology of the main 20 syntaxonomical classes of Greenland in a circumpolar context are discussed. Special attention is paid to latitudinal, longitudinal and altitudinal distribution. Most of the classes are known and described from the European mountains. The influence of climate warming on the Arctic vegetation types is discussed. Intensification of plantsociological research and establishment of an Arctic databank of Arctic relevés are highly needed to improve and extend classification of the vegetation of Arctic territories.

GRASSLANDS DECLINE, BUT WHAT HAPPENS TO THEIR FLORA: EXAMPLE OF ESTONIAN GRASSLANDS

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The high rate of human induced conversion makes temperate grasslands one of the most endangered habitats in the world. The grassland vegetation has been negatively affected due to land use change and agricultural intensification. To describe the effect of different processes (habitat loss, management change) on grassland vegetation we analysed the floristic composition of original grasslands (relevés from 1954), of their remnants (relevés from 2009) and of the young developing grasslands (data collected in 2009). Data of 21 original grasslands, 44 remnants and 26 young grasslands was analysed. Changes in species richness and species lists of these three groups of grasslands were analysed. Changes in environmental conditions were assessed using ecological indicator values (EIV) of species. We also studied if the species decreased or lost in old grasslands colonize the young developing grasslands. We revealed that species composition of the original grasslands and their remnants has changed significantly during the 50 years. Only 12-30% (depending on the region) of the area of remnant grasslands was managed in last years. We found 22 species which frequency has significantly decreased or which did not occur in remnants anymore: e.g. Briza media, Carex davalliana, Carex flava, Leucanthemum vulgare, Polygala amarella, Primula veris, Scorzonera humilis. The results showed that at least some of these species were absent in young developing grasslands. It is clear that remnants of original grasslands are losing their importance as source of grassland vegetation due to dramatic decrease in area and insufficient management. We will present the results of the comparison of species composition of remnant grasslands and young developing grasslands.

A NEW COMPOSITIONAL DISSIMILARITY CONSIDERING SPECIES' HABITAT PREFERENCE

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Numerical classification is a widely used tool in vegetation science. Contrary to traditional subjective classifications (e.g. Braun-Blanquet approach), it does not use the information on habitat preference of species. To overcome this drawback, (1) objective data has to be collected on species' habitat preference, and (2) new methods has to be developed that can handle this information. Development of large phytosociological databases completed the first task, but until now there was no solution of the second one.

Since most of the classification algorithms use dissimilarities instead of raw data as input, a new dissimilarity measure that can consider not only species' abundance data, but also similarities in species' habitat preferences, would be a good solution. Recent progress in the considering species' properties in beta-diversity calculation makes possible to develop such dissimilarity index. The theoretical background is that beta diversity calculating for two relevés can be regarded to dissimilarity between two relevés.

Rao's quadratic entropy is a diversity index considering differences among species. Its input data are species abundances (it may be measured by any scale, including presence-absence data) and a distance matrix of species according to the considered property (in our case habitat preference). I suggest that if this distance matrix is the complement of species associations calculated on large databases, Rao's beta diversity can be used as dissimilarity among relevés.

Traditional dissimilarities reach their maximum if the number of shared species is zero. Thus they cannot discriminate between such cases, while the new index can do it, considering differences in the habitat preferences of species.

JUICE-R: AN OPEN INTERFACE BETWEEN JUICE AND R PROGRAM

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JUICE-R is a new interface between JUICE (software for editing and analysis of ecological data) and R (program for statistical analysis). It offers a simple way of exporting data from JUICE, analyzing them in R program and potentially importing them back into JUICE. The main advantage of this function is the fact that it is open, which means that the user can apply either one of the R scripts available from JUICE-R website, use R script written by a colleague or simply write an R script himself. In case that customized R scripts are used, theoretical knowledge of programming language is not necessary. The JUICE-R website R (http://www.bit.ly/juice-r) is intended to serve as a reference point, where the R scripts can be freely downloaded and uploaded, together with the detail descriptions of their use. The JUICE-R website is based on an easy-to-edit syntax, similar to Wikipedia, which allows simple creating and editing of customized web pages. Note that the JUICE-R interface is under development and its functionality will depend on whether it will find patient users and enthusiastic developers, willing to share their R scripts via JUICE-R website. Recently available scripts include, e.g., advanced application for analysis of header data, calculation of stability of classification, estimation of the niche width using co-occurrence data, various methods of ordination analyses, regression and classification trees or rarefaction curves. Methods of ordination analyses, regression and classification trees or rarefaction curves.

THE GLOBAL INDEX OF VEGETATION-PLOT DATABASES (GIVD), A MAJOR NEW TOOL FOR VEGETATION SCIENTISTS: CURRENT STATUS AND PROSPECTS

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Vegetation-plot records or relevés, broadly defined as records of plant taxon cooccurrence at particular sites, constitute the primary descriptive data on which much of vegetation science is based and serve as the single most important data resource available to vegetation scientists. During the last two decades, various regional or national databases for such vegetation-plot data have emerged. The amount of data that became available through vegetation-plot databases facilitated, inter alia, consistent large-scale vegetation classifications. macroecological pattern analyses, and the assessment of global change effects on vegetation. However, it was not an easy task to retrieve the appropriate databases for such analyses, in particular at a supra-national level. Therefore, we compiled the Global Index of Vegetation-Plot Databases (GIVD; www.givd.info), supported by the EVS and Ecoinformatics Working Groups of the IAVS and co-ordinated by an international Steering Committee. GIVD is a metadatabase (available at www.givd.info) that contains descriptive data of vegetation-plot databases worldwide, such as scope of the database, owner and contact data, number, geographical and temporal distribution of the relevés, and environmental data available for these. Since its launch in autumn 2010, approx. 150 databases comprising approx. 3 million independent vegetation plots have been registered in GIVD. In my talk, I will (i) give a detailed overview of the available data, (ii) highlight the perspectives that GIVD provides for vegetation science, and (iii) discuss options for further development of GIVD.

IMPACT OF ABANDONMENT OF TRADITIONAL TRANSHUMANCE ON MEDITERRANEAN MOUNTAIN GRASSLANDS - CASE STUDY OF MT.VELEBIT, CROATIA

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The transhumance, traditionally the most important form of cattle breeding in Mediterranean basin, has been the main factor in landscape formation. Two thousand years of cattle breeding and agriculture on mountains along Eastern Adriatic Coast changed the primarily forest landscape into a mosaic of different open habitats. However, transhumance has been almost completely abounded on Croatian Mediterranean range of Dinarides in the last fifty years, which caused a dramatic change of grassland habitats. Mt.Velebit, located along the North Adriatic Coast, with its long and continuous tradition of cattle breeding and migrations has been chosen as a perfect natural laboratory for investigation of rapid vegetation changes. Along the slopes of Mt.Velebit, forest vegetation is predominantly deciduous, presented by dominating Quercus pubescens, Carpinus orientalis and Ostrya carpinifolia on lower, and Fagus sylvatica on higher elevations. Evergreen forests with dwarf Mountain Pine (Pinus mugo) form only the highest forest belt. Different mountain grassland types mainly match altitudinal forest belts. Analysis of multiple, recently made relevés of grassland and shrub vegetation along the altitudinal gradient as well as life form spectra analysis indicates the different velocity of habitat change in each mountain belt and stresses different species included. Along the vertical gradient the velocity of habitat changes decreases. On the lower grasslands the progressive vegetation succession is faster. Although the maintenance of larger number of species is mainly allowed, the general physiognomy of landscape is being substantially changing. In the belt above 1200 m a.s.l., a thin layer of soil, strong influence of wind and shorter growing season do not allow as rapid succession as in lower altitudes. Nevertheless, it is present thanks to the growth of dense, procumbent shrubs, which also change the composition of grassland communities, although the general physiognomy seems unchanged. The loss of biodiversity on species, habitat and landscape level of the Mediterranean mountain grasslands is more than evident and call for urgent active protection planning.

THE LICHEN SYNTAXA IN THE CHECKLIST OF HIGHER SYNTAXA OF EUROPE AN OVERVIEW AND WHAT WE CAN DO WITH THEM

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In the framework of the Checklist of higher syntaxa of Europe a synthesis of bryophyte and lichen syntaxa (microsyntaxa) was prepared, bryophyte syntaxa by Klaus Dierssen, the lichen syntaxa by the referent. The present checklist of cryptogam syntaxa comprises 26 classes with 48 orders and 123 alliances. Six classes contain only bryophyte syntaxa, 15 classes only lichen syntaxa and five classes both. All classes and their significant habitat factors are presented in short. This includes an overview of the main lichen (and bryophyte) habitats in Europe. Then the lichen syntaxa will be presented with more detailed, however basic information and pictures. Most lichen syntaxa are described from rocks, from eulittoral to the alpine zone. Ten classes with 39 alliances of lichen syntaxa and two mixed classes with 9 alliances are known (additional 3 classes and 10 alliances of bryophyte syntaxa). Five classes with 17 alliances of lichen syntaxa are epiphytic, including one class of communities from leafs and needles (and one class with 10 alliances of bryophyte syntaxa). Of the terricolous syntaxa three mixed classes with 12 lichen alliances and 19 bryophyte alliances are known (additionally two classes of bryophyte syntaxa with 7 alliances). The methods and the problems of community descriptions, which are peculiar to the cryptogamic communities, are discussed. Finally possibilities of applications are explained especially for the recognition of complexity and for possibilities of bioindication with species and communities, which are already established for e.g. air purity, forest quality and metal content of rocks and soil.
LANDMARKS AND SIGNPOSTS: THE NEXT TWENTY YEARS FOR THE EUROPEAN VEGETATION SURVEY

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In the twenty years since its informal beginnings as a small IAVS Working Group, the European Vegetation Survey has fostered some major scientific achievements in vegetation survey, information technology and syntaxonomy and has contributed to developments in environmental policy across the European Union and beyond. Using examples taken from the United Kingdom but of generic significance for our work, this paper examines some key challenges facing the EVS in the next two decades of its life: (1) relevé, constancy and 'optimal condition': what is vegetation like and what should it be like? (2) data, information and knowledge: how are syntaxa described and who says? (3) parameters, values and 'ecosystem services': how does vegetation work and how should it work for us? (4) plot, site and place: do nature and culture belong together?

NEW VISION ON SYNTAXONOMY OF HALOPHYTIC AND STEPPE VEGETATION OF THE VOLGA REGION (RUSSIA)

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The vegetation of Russia is studied for more than 30 years (Mirkin, 2008) from the point of view of J.Braun-Blanquet (1964) approach. Phytosociological units allocated in territory of Russia, are subordinated to the international system of syntaxons (Mucina, 1997; Rodwell et al., 2002; http://www.synbiosys.alterra.nl/synbiosyseu/).

Our research of the halophytic and steppe vegetation, and grassy vegetation of karstic relief structures, carried out in Middle and Lower Volga Basins (the Ulyanovsk, Samara, Saratov, Orenburg, Volgograd and Astrakhan regions) from 1994 to 2010, have allowed to make additions and changes to the volume of classes *Festuco-Puccinellietea* Soo 1968 (orders *Cirsietalia esculenti* Mirkin et Golub in Golub 1994, *Festuco-Limonietalia* Mirkin in Golub et Solomakha 1988, *Artemisietalia pauciflorae* Golub et Karpov in Golub et al. 2005, *Glycyrrhizetalia glabrae* Golub et Mirkin in Golub 1995 and *Scorzonero-Juncetalia gerardii* Vicherek 1973) and *Festuco-Brometea* Br.-Bl. et Tx. ex Klika et Hadac 1944 (orders *Festucetalia valesiacae* Br.-Bl. et Tx. ex Br.-Bl. 1949 and *Helictotricho-Stipetalia* Toman 1969).

SYNTAXONOMIC OVERVIEW OF THE VEGETATION OF GREECE: CHECKLIST OF HIGH-RANK SYNTAXA, DISTRIBUTION PATTERNS AND NATURE CONSERVATION

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In the framework of a non-funded initiative, a team of nine vegetation scientists, the authors of the present paper, develop a current synopsis of all syntaxa known from Greece. Main objective of this study is to provide a state-of-the-art overview of all vegetation types occurring in Greece based on relevé documentation. This synthesis includes only the high-rank syntaxa down to the level of alliance. All available literature sources of relevés (publications, theses, expert reports and unpublished relevés) have been collected and stored in a bibliographical database, structured in a flexible way for various basic and applied tasks. Our concept is largely based on the principles followed for the compilation of the European Vegetation Checklist, currently in progress. The scheme consists of approximately 50 classes and has been derived top-down by integrating validly published orders and alliances. The relevés were derived from more than 250 different sources. Their spatial distribution at different scales (mountains, mountain peaks, islands, islets and phytogeographical regions) give us a concrete idea on the existing gaps inside and outside the Natura 2000 ecological network, providing an insight for the future conservation management planning in Greece. A cross reference with the Annex I habitat types of the Directive 92/43/EEC has been established, in order to obtain a substantial basis for nature conservation surveying and monitoring in Greece.

THE DATA BASE OF ITALIAN VEGETATION RELEVÉS. A CARTOGRAPHIC, PHYTOSOCIOLOGICAL, SYNDYNAMIC, GEOSYNPHYTOSOCIOLOGICAL AND HABITAT (*SENSU* DIRECTIVE 92/43/EEC) DATABASE. THE REGIONE MARCHE CASE STUDY.

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It is here presented the Regione Marche cartographic data base which has been properly normalized for storing, processing and management of ecological data (in phytosociological, sinphytosociological, geosinphytosociological terms and data about habitats (sensu Directive 92/43/EEC).

This kind of structure represents a valid model for the design and the implementation of a geographic and geosynphytosociological data bank at a national level.

The Marche geographic information system is an effective tool capable of:

- processing and handling substantial volumes of mapping data in order to set up phytosociological, sinphytosociological, geosinphytosociological geographical maps, and habitats according to Directive 92/43/EEC with extensive legends of great semantic detail (www.ortobotanico.univpm.it/cartografia);

- implement applied research, multiple-scale, through studies of correlation and integration of the phytosociological, sinphytosociological and geosinphytosociological data, cartographic type, with the floristic and phytosociological data stored in specially made database (www.anarchive.it) adopted by the Società italiana di Scienza della vegetazione as a standard tool for the vegitaly project (http://www.scienzadellavegetazione.it/);

- monitoring allowing in the same areas, at different times (diachronic analysis), to make ecological comparison (in phytosociological and geosinphytosociological terms) consistent and meaningful;

- allow adaptation of habitats and their significance over time, according to different phases of implementation of the Habitats Directive, connected with EU enlargement, and then, after updating Annex I Dir 92/43/EEC and changes in the Habitat Manual interpretation, while keeping track of changes over time;

- identify management strategies of species and environments aimed at the preservation of biodiversity with a multi-scale spatial awareness at site level, region level or national Natura 2000 network level;

- implement the spread and sharing of geobotany and environmental knowledge through geobotany maps and their publication on the Web mapping applications

(www.ortobotanico.univpm.it/habitat; www.ortobotanico.univpm.it/cartografia).

THE IMPORTANCE OF FUNCTIONAL TRAITS OF PLANTS DURING THE RESTORATION OF A WOODED MEADOW

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Wooded meadow is an important community type due to high concentration of rare species and very high small-scale species richness. The area of wooded meadows has greatly decreased in Europe (including Estonia) due to abandonment threatening the preservation of its associated biodiversity. Hence, nature conservation has emphasized the importance of active preservation measures and restoration of wooded meadows. The aim of current study was to find out how the plant species with different functional traits and strategies recover after restoration. In order to achieve this goal we compare regularly managed, overgrown and restored parts of wooded meadow (restored 1; 5 and 10 years ago). Plant functional traits and strategies which were used are following: average height, ramet life-span, ramet increment, seed weight, seedbank longevity, dispersal mode of seeds, onset of flowering, duration of flowering, habitat preference, growth form, CSR strategy sensu Grime 2001. Our results show that the part restored 1 year ago was rather similar to abandoned part there were no significant differences between these parts in abundance of short and tall graminoids, C-, CSR-, SC-, C-strategists and species with different habitat preference, ramet life-span, onset of flowering. The abundance of short graminoids, S-strategists and species with onset of flowering in May in part restored 5 years ago was significantly lower than regularly managed part. The part restored 10 years ago compared with regularly mown part had no significant differences in abundance of tall graminoids, C-, CSR-, SC-, Sstrategists, species with annual ramets, onset of flowering in July and habitat preference to meadows. However, the abundance of short graminoids and species with onset of flowering in May in part restored 10 years ago was still significantly lower than in regularly managed part. The success of species after the restoration of wooded meadow is determined by different functional traits. It can be concluded that with ten years a certain success in restoration can be achieved, but this time is not sufficient to attain the state of regularly managed wooded meadow.

THE ITALIAN "CARTA DELLA NATURA" SYSTEM

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"Carta della Natura" (Map of Nature) is an informative system created following the directive of the Italian Law 394/91 on Protected Natural Areas. The aim is to identify the status of the natural environment in Italy and to assess quality and fragility values of habitats. "Carta della Natura" is coordinated by ISPRA – "Italian National Institute for Environmental Protection and Research". The institute, whose responsibilities relate mainly applied research, acts under the vigilance and policy guidance of the Italian Ministry for the Environment and the Protection of Land and Sea and has direct relations with the European Environmental Agency.

"Carta della Natura" represent a basic instrument for knowledge and assessment of the national territory, based on a Geographic Information System where thematic maps and geo-referenced environmental information are available.

Habitats are expressed and represented by the biotopes as described in the CORINE Biotopes System. A subset of 230 items from the original legend has been selected, in order to guarantee a reference legend in habitats interpretation, representing all mapping habitats in Italy at 1:50.000 scale.

Correspondence with EUNIS habitat type and Natura2000 network sites code has been identified for each habitat, in order to compare the maps and to highlight the habitats distribution and presence of the Annex I Directive Habitat but also their fragmentation and rarity. This approach is extremely functional to highlight possible shortcomings of Natura2000 in Italian ecosystems.

The GIS approach, allow to evaluate environmental quality and vulnerability. The evaluations are realized by the use of standardized computer procedures, by using a set of indicators related to the physical, biotic and anthropogenic components of the territory applied for each unit identified in the informative layer.

The output is a framework of the natural value of territory, its anthropogenic pressure and habitats sensibility.

The "Carta della Natura" data are part of ISPRA environmental services that has great value to the community being available on demand to stakeholders and Institutions.

ASSESSMENT OF THE NORTH ADRIATIC PASTORAL LANDSCAPE (ĆIĆARIJA, CROATIA)

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European semi-natural calcareous grasslands are very species-rich ecosystems, considered priority habitats by the European Union (92/43/EEC Directive) and judged worthy of conservation. They are in strong decline in extension and threatened by abandonment throughout Europe. This trend has been also observed in the North Adriatic pastoral landscape (Poldini 1989; Kaligarič et al. 2006; Kaligarič & Poldini 2007) and on the Cićarija mountainous plateau as well. This area (about 1,000 ha) was studied in order to understand which factors drive floristic differentiation (environmental features and/or grassland management conditions), to identify indicator species sets linked to those factors and to appraise the effects of management type on the coenological and functional composition of indicator species sets. To achieve the research aims, 73 phytosociological relevés were carried out; for each of them field data (altitude, aspect, slope angle and land form), productivity measurements and information on grassland management were collected. Redundancy analysis (RDA) identified a productivity-related soil moisture gradient as the environmental driving force of grassland floristic differentiation. The variability of floristic data set was better explained by environmental parameters than by management (use/not use). Indicator species analysis (ISA) detected the indicator species sets related to environmental features and management type. Shifts in coenological composition comparing used and abandoned grasslands, were linked to the entry of successional species in ungrazed pastures and to the loss of meadow species in hay meadows. The variations that emerged from the comparison of the functional characteristics of the indicator species of grazing and of mowing (avoidance strategy, life form, and storage organs) proved more important than those observed in comparing used and abandoned grasslands. Such changes could be explained because of the low intensity use of such pastoral ecosystems (undergrazing and lack of periodic mowing).

VEGETATION CHANGES AT AN HIGH ELEVATION SITE OF THE ALPS SINCE 1950 IN THE CONTEXT OF CLIMATE AND LAND USE CHANGE

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Global air temperature warmed by an average of 0,6±0,2°C since the beginning of the 20th century. Climate change impacts on biotic and abiotic environmental components are expected to be greater at higher altitudes and latitudes. In the Italian Central Alps, at Stelvio Pass, a phytosociological map of the vegetation located at elevations above 2200 m a.s.l. was drawn by Giacomini and Pignatti (1955). In 2003 a new phytosociological map was drawn (Cannone), using the same survey criteria of Giacomini and Pignatti (1955) to assess and quantify by GIS the changes experienced by vegetation. Our data show that in the period 1953-2003 the vegetation experienced changes in area which are mainly related to climate change impact (Cannone et al. 2007). At our site, the mean annual air temperature increased of about +1.0 °C, with a more pronounced rise since 1980. Shrubs showed rapid expansion, with the highest rates (of +5.6% per decade) at altitudes between 2400m and 2500m. The expansion of shrubs mainly occurred at the expenses of the alpine grasslands, which exhibited a shift towards higher elevations and resulted in a net decrease (> 8%) of the grasslands coverage in the whole area. Above 2500m, vegetation coverage exhibited unexpected patterns of regression associated with increased precipitation and permafrost degradation. As these changes follow a sharp increase in both summer and annual temperatures after 1980, we suggest that vegetation of the alpine (2400-2800 m) and nival (above 2800 m) belts respond in a fast and flexible way, contradicting previous hypotheses that alpine and nival species appear to have a natural inertia and are able to tolerate an increase of 1-2°C in mean air temperature. In addition, vegetation data and changes are analyzed for each phytosociological association comparing its areal distribution and floristic composition in 1953 and 2003 and discussed in the frame of the three main adaptation strategies suggested by Theurillat and Guisan (2001) in response to climate change impact: a) persistence; b) migration; c) extinction.

THE NETWORK OF DATA BASES OF PHYTOSOCIOLOGICAL RELEVÉS OF ITALIAN VEGETATION: AN EXAMPLE OF AN APPLICATION OF A DATA MINING APPROACH TO THE REGIONAL DATA BASE OF FRIULI VENEZIA GIULIA

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The activities and the results to build a network of phytosociological relevés for Italian vegetation is shortly revised. The importance and feasibility of networking data bases of the administrative units of different hierarchical level is stressed considering the framework of NATURA 2000. Data bases of phytosociological relevés may be used for several aims either scientific and managerial. The integration of these data bases with floristic data bases should be useful for assessing spatial biodiversity patterns at different geographic scales that would explain the relationships between the floristic vegetation composition, its structure and the physical chemical environment. Biological species descriptions in floristic data bases can lead to different vegetation descriptions. The chorological description of the species, namely their belonging to phytogeografic elements can used to understand the importance of species migrations in the formation of the actual plant associations and in modelling future trends owing to climate and land cover changes that may occur in a given area. This paper presents an example of a data mining approach applied to the vegetation and floristic data base of Friuli Venezia Giulia in order to assess the behaviour of Boreal element in the forests of the region. The results are commented at the light of climatic and anthropogenic gradients.

MOLINIA CAERULEA (L.) MOENCH COMMUNITIES IN THE PLAIN PART OF UKRAINE

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Communities with participation of *Molinia caerulea* (L.) Moench in the plain part of Ukraine are distributed mainly in northern part of the Forest zone. During 20th century the areas of community decreased due to bog reclamation. The syntaxonomy of Molinia caerulea communities was performed on the base of 165 relevés both recent and historical data using Cocktail-method. Total 7 sociological species groups were used for the formal definition of the 2 associations of the Molinion W.Koch 1926 alliance (Molinietalia W.Koch 1926 order, Molinio-Arrhenatheretea R.Tüxen 1937 class). Association Junco effusi-Molinietum R.Tüxen 1954 distribute all over the Forest zone in conditions under the grazing management. Association Selino carvifoliae-Molinietum caeruleae Kuhn 1937 spread only in NW Ukraine under hay-mowing regime. Molinia caerulea present as occasional element in communities of other syntaxa of Molinio-Arrhenatheretea class (Cvnosurion cristati Tx, 1947 and Deschampsion cespitosae Horvatic 1930 alliances) and Scheuchzerio-Caricetea fuscae Tx. 1937 (Caricion davallianae Klika 1934 alliance) also. These communities were compared together using some of their ecological characteristics and analyzed with DCA. The level of communities diversity was analyzed. In the communities of the Junco effusi-Molinietum were revealed the 5 species from Red Data Book of Ukraine (2009) and in communities of Selino carvifoliae-Molinietum caeruleae 15 species correspondingly. Molinia caerulea communities are protected in Cheremsky, Rivnensky, Polissky nature reserves and other protected areas of Ukrainian Polissya but in spite of the fact that these communities are include in Habitat Directive (6410 - Molinia meadows on calcareous, peaty or clayey-silt-laden soils), still have not the mechanisms for their conservation in Ukraine because Molinia communities are not included in Green Book of Ukraine (2009) - only one legal document which regulate the conservation of the plant communities

OCEAN-FACED BOREAL VEGETATION OF NORTH PACIFIC ASIA

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Phytosociological data obtained in series of projects started in 1996 served as a basis for the classification of boreal vegetation occurring on the Pacific coast of Asia. Most peculiar for the area, the Betula ermanii forests were placed into a new order, Betuletalia ermanii, that belongs to the class Betulo-Ranunculetea. These forests occur in a severe sub-oceanic climate with cold summers, mild winters, and a nearly equal distribution of precipitation throughout the year. Other important zonal vegetation types associated with the stone birch forests, the Alnus fruticosa thickets and tall herb meadows, were assigned to new alliances belonging to the order Streptopo-Alnetalia maximowiczii. All representatives of the Betulo-Ranunculetea in the North Pacific Asia are developed in areas of snow accumulation and characterize the cold, wet, sub-oceanic climate within the northern boreal zone. Relatively stronger continental climatic conditions in the central Kamchatka depression support isolated populations of Larix cajanderi and Picea jezoensis related to the class Vaccinio-Piceetea. These forest types form a belt at lower elevations. Another important vegetation type are *Pinus pumila* thickets that occupy lower elevations in the north of Kamchatka (Koryakia), form a distinctive vegetation belt above the tree line and occur at azonal sites along the sea coasts on sandy deposits. The Alpine vegetation belt is characterized by a complex of dwarf-shrub, graminoid and herb tundra communities (classes Carici-Kobresietea, Loiseleurio-Vaccinietea, Phyllodoco-Harrimanelletea, Dicentro-Stellarietea, Montio-Cardaminetea and Salicetea arcticae) that occur under conditions of a heat deficit and very short growing season. Azonal habitats, such as wide valleys, sites affected by cold air drainage, coastal mires, snow patches, volcanic deposits and others, occupy large areas in North Pacific Asia. Several vegetation types, mainly coastal tundras, mesic and hygric meadows, Betula platyphylla, Populus suaveolens and Alnus hirsuta forests are widely distributed on azonal sites. River valleys are occupied by forests of Populus suaveolens, Salix udensis and Chosenia arbutifolia.

BOREAL AND HEMIBOREAL RAISED BOGS IN NW RUSSIA AND BELARUS

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Mires of NW Russia and Belarus are situated in the limits of boreal and hemiboreal biomes. They are raised bogs, transitional mires and fens. Territory of Belarus is represented by both hemiboreal and temperate deciduous forest biomes. Raised bogs predominate in NW Russia as well as in the north of Belarus and they are rather similar. Sedge fens and forest swamps are widely spread in the southern part of the country named the Belorussian Polesie. But the Morochno mire adjacent to Ukrainian border consists of a pine bog with hummock-hollow complexes and open sedge mires.

Mires of NW Russia and Belarus are well studied. Vegetation of the NW Russian sphagnum mires was analyzed and classified using both floristic and dominant approaches (Galanina 2004). Vegetation maps of studied raised bogs were made in a large scale. In Belarus an inventorying of raised bogs based on detailed field observations and remote sensing data was made during last decade. Monograph dedicated to the biggest raised bog in Europe (excluding Russia) is recently published (Grummo et al., 2010). It presents a large scale vegetation map of the Elnya bog and a set of different ecological maps. Common legend for both NW Russian and Belorussian raised bogs is based on approaches of the Russian school of vegetation mapping.

An idea of making of the Circumboreal Vegetation Map (CBVM) in a scale of 1 to 7 500 000 was initiated by international group of experts in 2008. There are some questions to be discussed:

Do forests and mires of Belarus should be mapped on the CBVM map? As for now, Belarus is not listed by a working group among the countries covered with boreal/hemiboreal vegetation.

How to delimit the southern margins of the boreal and hemiboreal biomes in Belarus?

Shall we map the boreal raised bogs appearing more south in biome of temperate deciduous forests on the CBVM?

THE VEGETATION OF THE SCI MONTE RUSSU (NORTH SARDINIA): SYNTAXONOMY AND DIACHRONIC ANALYSIS OF HABITAT

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The object of this study is the vegetation and habitat analysis of the Site of Community Importance (SCI) Monte Russu. This area is an important SCI located in North Sardinia, characterized by a very high concentration of endemic species and priority habitats, as reported in Directive 92/43/EEC. Despite the strong ecologic value of SCI Monte Russu, the region is under an increasing humane pressure. The syntaxonomical point of view represents the substrate to evaluate the habitat structure. A releve table was realized and the data were analyzed with multivariate approach (Syntax 2000, Podani, 2001), implemented the process with two steps, using Van der Maarl (1979) values. Furthermore the matrixes were elaborated with the algorithm complete link (Orloci, 1978). The phytosociological relevé was uploading into a geodatabase. The new geodataset originated represents the substrate for the habitat identification according to CORINE Biotopes scheme (A.A. V.V., 1989-1991), implemented with manual of habitat interpretation (Biondi & Blasi ed., 2009). The main result of the phytosociological studies was a G.I.S. of the vegetation and habitat. This kind of technique was used to the diachronic analysis of vegetation and habitat is based on remote sensing techniques, using satellite image, aerophotograph information, documentation and literature data. This large dataset of information was organized according to the information algorithm (Gaeta, 2002). This approach allowed us to illustrate the diachronic scheme, and as a consequence to study the humane influence in this area, in the past.

A PRELIMINARY OVERVIEW OF THE PLANT COMMUNITIES OF THE SINAI DESERT, BASED ON AN INVENTORY OF AVAILABLE PHYTOSOCIOLOGICAL DATA FROM LITERATURE AND A FIELD SURVEY OF UNDERSAMPLED AREAS

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Egypt has a long history in vegetation research, dating back to the 1930s. However, although several regional studies on plant communities have been carried out, there has never been compiled a complete classification overview documented with vegetation tables. In 2008, a first international workshop was organized by Tanta University for the input and management of the vegetation data. This workshop has resulted in a new spirit for phytosociological research, resulting in a set of initiatives. Among those, there is the aim to compile a National Vegetation Databank for Egypt and a National Vegetation Map, as well as a series of studies dealing with the major biomes of Egypt. The present study on the vegetation of the Sinai desert must be seen within this context. For this area, one of the major biomes in Egypt, several vegetation surveys have been carried out, but so far there was no overview of the existing vegetation data, not all areas have been investigated well, and the data were not available in a standardized way. Starting from these omissions, the present study is aiming at (1) an inventory of all available phytosociological data on desert vegetation of Sinai, (2) a field investigation of areas where no or little research has been carried out, and (3) the compilation of a preliminary overview of the plant communities of Sinai region. The research has shown that four major vegetation groups can be distinguished, which reflect the important geographic regions in the Peninsula: Coastal desert communities, Inland desert communities, Plateau desert communities and Mountain desert communities.

BRAMBLE SCRUB DIVERSITY ALONG THREE LANDSCAPE TRANSECTS A GIS BASED MULTI-SCALE ANALYSIS

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Rubus scrubs (*Pruno-Rubion radulae*, class *Rhamno-Prunetea* and *Lonicero-Rubion silvatici*, class *Lonicero-Rubetea plicati*) are forming a distinct part of the landscape in the Northwest European part of the European Sand Belt. Vegetation composition of Rubus scrubs was sampled along three randomly chosen 100km long transects in the Northern, Central and Southern part of the Netherlands in 187 relevés of 30 m². In the transects, 65 Rubus species were found, the number of Rubus species per relev was 1-7 (avg. 3.22). In total 21 communities could be distinguished, from which 7 could be assigned to described communities, viz. *Rubetum grati typicum* (all three transects), *Rubetum grati rubetosum ammobii* (Northern transect), *Rubetum silvatici* (Northern transect), and *Pruno-Rubetum sprengelii* (all three transects, but especially the Central). In all three transects communities could be distinguished which formerly were included in the *Rubetum silvatici*, but which probably deserve association status on their own. GIS analysis on the basis of soil, geology and geomorphology, land use and landscape type maps is used to explain community diversity and *Rubus* distribution.

BOREAL VEGETATION OF THE KAMCHATKA PENINSULA AND THE ADJACENT REGIONS AND ITS MAPPING.

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The Kamchatka Peninsula is situated in the North of the Russian Far East and belongs to the Boreal taiga zone. Zonal vegetation of central Kamchatka is represented by Ajan spruce (Picea ajanensis) forests, Cajander larch (Larix cajanderi) forests as well as by secondary Japan birch (Betula platyphylla) and aspen (Populus tremula) woods. On the coastal plains and slopes stone-birch (Betula ermanii) forests predominate. Vast territories of mountain slopes are covered by Siberian dwarf-pine (Pinus pumila) woodlands and dwarf-alder (Alnus *fruticosa var. kamtschatica*) thickets. The mountain tops and ridges are occupied by dwarf-shrub-rich mountain tundra communities. The Kamchatka isthmus and the Koryak region belonging to the Beringian forest-tundra zone are characterized by the predominance of dwarf-pine and dwarf-alder communities on the watersheds. Larch and stone-birch open woodlands occur only in the valleys. The oligotrophic dwarf-shrub heath communities (*Empetum nigrum, Vaccinium uliginosum*, etc.) are wide spread on the sea-shores, plains and slopes. They are very similar to mountain tundra dwarf-shrub communities. The goal of the investigation is to compile the small-scale vegetation map of the Kamchatka Peninsula and the adjacent territories of northern Koryakia and the Koryak upland. The background of the map includes: the MODUS space image, the digitized topography map, the digitized geobotanical map of the USSR (1956), the forest map of the USSR (1991) and the original field data including about 3000 relevés. With the use of the ArcGIS 9.3 package the background was combined with the field data and the contours size, shape and contents were corrected. The minimal contour size accepted depending on the vegetation cover structure was 0,04 cm² (225 km² at scale 1:7.500.000). The main principles of mapping used: the potential vegetation is shown; zonal vegetation types are shown for the plains; the following altitudinal belts are shown for the mountain regions: conifer forests, deciduous forests, subalpine dwarf-woodlands (krummholtz) and mountain tundra. If the vegetation units alternate, the category of combinations were used.

PHYTOSOCIOLOGICAL DATA AS A TOOL FOR POLITICAL REQUESTS IN FRANCE

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In France, European Habitats Directive has contributed towards a better knowledge policy on biodiversity within the context of strategies for habitats conservation and land management. Indeed, public stakeholders are waiting for objective informations concerning habitats: location, conservation status, rarity, threats, dynamic. In order to answer to political requests, several resources were developed. Habitats books have been realized to facilitate description, identification and management plans for European habitats present in France. A Prodromus of the vegetations of France was published in 2004, up to the sub-alliance level. It is now progressively completed up to the association level by the French Society of Phytosociology. Overviews of vegetation types were also established at regional scales. The National Museum of Natural History in Paris is in charge of the centralization and validation of these different phytosociological works. In addition, the Phytosociological Center of Bailleul owns an important international documentation. Some examples of using these resources will be presented through the regional activities of the National Botanical Conservatory of Brest, in particular regarding the survey, mapping and monitoring of habitats. Despite a rich phytosociological literature available to answer to French politics requests, all the stakeholders involved in the conservation management of habitats are facing difficulties to access to such information. To improve this situation, computing tools should be developed to modernize the French phytosociological approach, but it requires a review of the current classification as will be shown through a commented example of a published table. Thus, it makes sense to take part to the activities of EVS with the aim to elaborate a national database allowing then a numerical classification and to perform tools for habitats identification. A project is also to develop an ecological information system similar to SynBioSys.

THE SUBALPINE COMMUNITIES OF *VACCINIUM MYRTILLUS* OF VITOSHA MT. (BULGARIA) ECOLOGY AND PRODUCTIVITY

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The case study is conducted on the territory of Vitosha Mt., near the capital city of Bulgaria Sofia, during 2006. The ecological objectives in the horizontal and vertical distribution of the scrub communities of *Vaccinium myrtillus* in the subalpine zone are studied. Base on the phytosociological structure of the investigated phytocenoses ass. *Festuco validae-Vaccinietum myrtilli* nom.prov. is announced and its relations to other associations of the neighbouring to Bulgaria countries are analyzed. A methodology for assessment of economic reserves of fruits and herbs is also applied which shows that the available resources of *Vaccinium myrtillus* within the borders of ass. *Festuco validae-Vaccinietum myrtilli* nom.prov. can be used only for personal needs.

WETLAND VEGETATION OF THE SWANSON RIVER LOWLANDS, KENAI NATIONAL WILDLIFE REFUGE, ALASKA

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Vegetation of lakes and mires in the Swanson River lowlands of the Kenai National Wildlife Refuge, Alaska was studied to identify major community types. 177 relevés from 30 lakes represent the range of structural and compositional variation in the matrix of vegetation and landform zonation. Plant communities and their associated environmental variables were analyzed by multivariate methods including CANOCO 4.5 and JUICE 7. Eleven major community types were distinguished within 5 physiognomic-ecological types: I. Woodland mires - Picea mariana-Ledum decumbens-Vaccinium vitis-idaea-Sphagnum girgensohnii treed mire. II. Dwarf shrub mires - Ledum decumbens- Oxycoccus microcarpus-Sphagnum fuscum mire, Betula nana-Carex livida-Gymnocolea inflata mire, Andromeda polifolia-Carex limosa-Sphagnum papillosum mire, Myrica gale-Menyanthes trifoliata-Sphagnum squarrosum mire. III. Deciduous shrub marsh - Salix pulchra- Calamagrostis canadensis-Drepanocladus aduncus shrub marsh, Alnus tenuifolia- Calamagrostis canadensis shore marsh. IV. Graminoid shore marsh - Carex rostrata-Calamagrostis canadensis shore marsh. V. Forb mires - Menyanthes trifoliata-Carex magellanica-Sphagnum riparium mire, Menyanthes trifoliata-Carex limosaobtusum mire, Menyanthes trifoliata-Myrica gale-Sphagnum Sphaqnum angustifolium mire. These were interpreted as a complex gradient primarily influenced by water table depth, cover of open water, percent of rubbed fiber, percent soil organic matter, distance from lake margin, and pH. Comparison is made with mire types from boreal regions of western Alaska.

EIGHTEEN-YEAR VEGETATION SUCCESSION IN AN EXPOSED DANUBE RIVERBED IN THE SZIGETKÖZ REGION, HUNGARY

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The Szigetköz is situated in the northwest part of Hungary. In 1992, most of the water in the main Danube channel was diverted into a canal built to supply a hydroelectric power plant. This large-scale modification led to the decline of surface water level in the active floodplain as well as the drop of groundwater depth beyond the dikes. The most severe water level decline took place on the active floodplain at the section of the Great Danube channel right upstream of the canal supplying the hydroelectric power plant. The aim of our work is to study changes in abundance, species composition and vegetation patterns during the initial phase of spontaneous succession in this very rapidly developing new habitat. We hypothesized that the new soil water gradient and the annual fluctuations in water level will cause a slow shift in the natural river bank vegetation zonation towards the new shoreline. Thus, on a time scale of decades, a zonal development of river bed weed community, willow thicket, softwood gallery forest and hardwood gallery forest is expected. One belt transect running from the current shoreline to the original shoreline was established in 1994. The status of the vegetation was recorded along the transect in early summer each year between 1994-2010. Terrestrial plants have very quickly established in the dried-up riverbed of the Old Danube channel. In the first years, the exposed gravel substrate abounded in usual riparian plant species otherwise common on bars. On the new shoreline, a 30 m wide belt of Salix alba has developed. Above this, a zone of water demanding tall forb community has established which tolerates temporary inundation. Further away up to the original shoreline, a strip of vegetation composed of Acer negundo has appeared. Unlike the white willow belt, this zone developed slowly. At first, knee-high box elder saplings vegetated in the dry grassland, but once their roots has reached permanently wet soil layers, their growth has greatly accelerated. In the former riverbed, the mass appearance of invasive plants (i.e. Solidago gigantea, Aster lanceolatus, Fallopia xbohemica) raises serious concerns for nature protection.

DRY SANDY LEVEE GRASSLANDS IN THE NETHERLANDS AND AN INTENDED SYNTAXONOMIC EUROPEAN OVERVIEW

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Along rivers sand is deposited and sandy levees develop. In the Netherlands two grassland associations are distinguished that are characteristic of dry, relatively nutrient poor, calcium containing, sandy levees, the Medicagini-Avenetum pubescentis De Leeuw in Braun Blanquet et Moor 1938, Sedo-Thymetum pulegioides Doing ex Weeda, Doing et Schamine and Festuco-Thymetum serpylii Tuxen 1937. Their syntaxonomic position is still partly disputed (Sedo-Cerastion, Meso-Bromion, Plantagini-Festucion). According to our historical research, nowadays the quality of these grasslands changed and they strongly declined (surface decrease more than 90% in last decades) and are rare and threatened. In the habitat directives dry fluviatile grasslands are designated as habitat types with priority. In 2010 we started a research into the ecological amplitude of fluviatile arassland communities and their characteristic species and the influence of sand deposition. In this presentation we will report about a plan to compare the site conditions in the Netherlands with those in some other countries like Latvia, Lithuania and Germany. Besides we plan a project to study the syntaxonomic position of the sandy levee communities in the Netherlands in comparison with the syntaxonomy of comparable grasslands in other European countries. Species like Artemisia campestris, Thalictrum minus, Veronica prostrata, Veronica austriaca ssp. teucrium, Thymus serpyllum, T. pulegioides, Sedum sexangulare, S. reflexum, S. album, Salvia pratensis, Potentilla verna, Plantago media, Medicago falcata, Herniaria glabra, Galium verum, Euphorbia cyparissias, E, seguieriana, Eryngium campestre, Dianthus deltoids, Cynodon dactylon, Cerastium arvense, Carex caryophyllea, Pimpinella saxifraga, Sanguisorba minor, Koeleria macrantha, Helictotrichon pubescens, Trifolium striatum and Orobanche lutea were used for relevé selection. Thanks to the kind cooperation of several countries and colleagues our database is growing and already contains or will contain relevés from Belgium, Germany, France, Great Britain, Ireland, Latvia, Lithuania, Austria, The Netherlands, Slovakia, the Czech republic and the Volga region.

MONITORING CHANGES IN PLANT SPECIES COMPOSITION IN A SUBMEDITERRANEAN FOREST OVER A SIX YEAR PERIOD

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Monitoring by permanent plots is a means of indicating or explaining ecological change or successional pathways. In the present study we examine the interannual temporal turnover in species composition of a forest herb layer over six years. The field work was conducted in deciduous mixed oak forests of NW Greece, which were subject to three disturbance regimes respectively: i) heavily disturbed plots (long-term overgrazing), ii) undisturbed control plots, and iii) plots under succession (forest recovering after recent cessation of overgrazing). In our analyses, we distinguished two life-history categories: short-lived species (i.e. annuals and biennials) and perennial herbaceous species. We found that approximately half of the accumulated species richness over the six years is accommodated as temporal turnover. Only in overgrazed plots, short-lived species contribute significantly more temporal turnover than perennial species. Irrespective of species life-history, temporal turnover in undisturbed control plots was not significantly different from that in plots undergoing succession. Long-lived species displayed lower temporal turnover than short-lived species, apart from the heavily grazed plots. The correlation between spatial and temporal turnover was significant and negative only for the short-lived species. Most species were rare in both space and time. The correlation between spatial and temporal distribution was significant and was mainly due to annual species. Our analyses supported that the space for time substitution applies in the patterns of species turnover. When we compared the spatial turnover of species to the temporal turnover, we found that the similarity in species composition decreased as the time period between observations increased, as is the case with distance decay.

THE GEOGRAPHICAL TYPES OF THE SIBERIAN HIGH MOUNTAIN VEGETATION FOR THE CIRCUM BOREAL VEGETATION MAP

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The vegetation diversity in Siberian Mountains is connected to the area of the boreal forests. The Highlands are under the direct influence of atmospheric circulation and free transfer of air masses. The alpine vegetation is less differentiated than vegetation below lying boreal forests which are more dependent on local environmental conditions. Regional differentiation of alpine vegetation is linked to more a floristic differences of mountain communities and a lesser extent with a coenotic diversity. 4 geographical types of the high mountain vegetation exist. Alpine system includes the altitude belts: subalpine (meadows, bushes, parks, elfin-woods), alpine (meadows, alpine tundra), subnival (snow meadows, mats) and nival. Powerful snow covers, good drainage, absence of permafrost are characterized for alpine highlands. This system characterizes most wetted parts of mountains with a temperate-continental type climate Altai, Western Sayan, East Savan, Goltsy system includes the belts; subgolsy (elfin woods, woodlands, meadows), tundra (low bush tundra), goltsy (epilitho-lichen tundra, boulder fields), nival. This system is typical for the mountains with continental and cold climate types. Goltsy system evolves in a low volume of snow cover, development geocryologic processes, low soil temperature and high moisture. This system predominated in the Boreal Siberian Mountains.

Tundra-steppe system with the belts: cryophyte steppe, mountain steppe tundra, mountain tundra, subnival and nival is formed under increased continental climate, extreme dryness. This system is found in the Southern Siberian Mountains. The boreal forest belt is heavily reduced, a vegetation of all belts are presented by a xerophytic communities. The Northern Pacific Ocean system of high mountain belts is formed under the influence of Pacific climate regimes. It is characterized by heightened role of heath tundra and elfin birch woodland and occupies the alpine zone of Yano-Kolyma plateau, Kamchatka, and Kuril Islands.

SPATIAL MODELING OF FOREST VEGETATION DYNAMICS AND MAPPING APPROACH IN GIS

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The modern concepts of protection and biodiversity monitoring assume flora and vegetation detail inventory, registration of dynamic process and permanent accumulation of an information. Supporting vegetation layer within the framework of GIS allows to create information models of spatial biodiversity structure, including cartographic and prediction models. Mapping approach in GIS had been used for investigation of tree species population dynamics and plant productivity at landscape level in ecological regions including all basic formations of subtaiga and deciduous forest ecosystems of east European Part of Russia on the area of 68.000 km² at Middle Volga basin. That enables to study dynamics and to observe mutual relations of major wood dominants in a band of mixed coniferous-deciduous forests. The information on flora biodiversity, plant biomass, primary productivity and oxygen production were used as indicators of environment quality and landscape stability; spatial analysis gave the possibility to estimate the natural and anthropogenic trends in its dynamics. For construction of prediction model of population dynamic imitation neural networks were used. The main trends of four leading tree species were calculated: Quercus robur and Picea fennica - populations of edificators; Tilia cordata, forming long-term-derived forests; Betula pendula, forming secondary birch forests. The expert systems based on the GIS databases open a possibility in ecosystem dynamics modelling and paleolandscape reconstruction. Experience of expert system forming for reconstruction of foreststeppe region vegetation cover dynamics in Holocene, is described in work. Maps of forest vegetation (reliability scale: 1 - presence; 0 - absence) at the periods: IX-X, XIV, XVII, XVIII, XX centuries, map of anthropogenic impact distribution, based on relief model and archaeological monuments information were produced.

PSEUDOSPECIES: A NEGLECTED YET USEFUL CONCEPT IN COMMUNITY DATA ANALYSIS

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Question: Are pseudospecies an appropriate concept of data transformation for cluster analysis in vegetation ecology? May pseudospecies compensate a quantitative information contained in vegetation data sampled by Braun-Blanquet cover/abundance scale? Methods: Several pseudospecies combinations were compared with other transformations of cover/abundance data using five different vegetation data sets. The similarity between two data transformations within the same data set was indicated by mean Goodman-Kruskals lambda computed for a rank of partitions from two to a maximum number of meaningful clusters. Results: hierarchical classifications based on pseudospecies tended to be similar to classifications with highly transformed metric data, while the relation to untransformed cover data or to ordinal clustering was relatively low. Conclusions: the concept of pseudospecies provides an important alternative to quantitative analysis of phytosociological data sampled using ordinal scales. Pseudospecies preserve main part of quantitative information contained in the data, fully fit to rough cover-abundance scale and avoid the inappropriate use of calculation methods designed for metric data.

PHYTOCOENOLOGICAL APPROACH TO EVALUATION OF VASCULAR PLANT BIODIVERSITY RICHNESS AND ENDEMO-RELICTNESS OF THE KARST REGIONS (PRENJ-CVRSNICA-CABULJA MTS.,W. BALKAN)

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The complex of karstic mountains Prenj-Cvrsnica and Cabulja in Herzegovina (W. Balkan) is characterized by high level of both geomorphology and biodiversity richness. This has been confirmed by a research of plant communities, their structure and dynamics, which took place throughout several seasons from 2005 to 2008. In the investigated area the vegetation cover, as a reliable indicator for specific karstic circumstances, is being differentiated in a great number of syntaxa (plant communities) that encompass over 2500 vascular plants. On the surface of about 100.000 ha identified were up to 236 plant associations, 116 alliances and 63 vegetation orders that belong to 34 classes. This amounts 34% of total of vegetation classes at the European level and 100% of so far known vegetation classes in Bosnia and Herzegovina, over 80% of classes at the level of Montenegro and Croatia. There have been identified nearly 450 endemic and relict species, which is why most of the identified communities are endemic and relict ones, not only at the level of association but also at the level of higher syntaxonomic categories, such as alliance and order. The highest diversity level characterizes those communities that make a direct contact with the calcareous geological foundation either in rock crevices belonging to the class Asplenietea trichomanis, or screes on limestone that are comprised by the classes Thlaspietea rotundifolii and Drypetea spinosae, then sub-alpine and alpine pastures Elyno-Seslerietea, and rocky grasslands Thero-Brachypodietea. That high level of floristic and vegetation richness places this area among the most diverse areas both in Europe and whole Mediterranean. Such pattern of vegetation (syntaxonomy) and floristic diversity confirms undoubtedly the unique role of dinaric-herzegovina's karst as a complex of unrepeatable ecological factors on global scale.

EVALUATION OF RANDOM, STRATIFIED RANDOM AND PREFERENTIAL SAMPLING DESIGNS: A CASE STUDY FROM OAK WOODLAND VEGETATION

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Disadvantages of preferential sampling of vegetation data with respect to statistical analysis have often been discussed. We compared differences in the structure of vegetation data collected using different phytosociological sampling methods. The four compared methods initially differed in the spatial arrangement of plots: (1) simple random sampling; (2) environmentally stratified random sampling; (3) random sampling stratified using vegetation map; and (4) preferential sampling. Each sample included 35 plots of oak and oak-hornbeam woodland vegetation collected in a compact area of 2.5 km². The data set obtained by simple random sampling showed lowest total species richness, lowest average species number per vegetation plot and lowest number of rare species. These variables grew with increasing subjectivity of sampling. Sample obtained by random sampling stratified using vegetation map were assessed as the most variable using ordination techniques, while simple random sampling yielded the least variable data set. Random sampling stratified using vegetation map also yielded data with the largest number of diagnostic species per cluster after classification with modified TWINSPAN algorithm, while clusters coming from the simple random sampling were the most poorly delimited. When focusing on the differences between simple random sampling and preferential sampling (the latter being often used by phytosociologists), we have observed that preferential sampling lead to higher total number of species, higher variation in recorded vegetation, higher number of diagnostic species in a classified data set and the avoidance of transitional vegetation. Most of other differences result from several different mechanisms and it is difficult to generalize them to other vegetation types. The often suggested environmentally stratified random sampling is difficult to evaluate as its results are strongly dependent on the chosen stratification criteria.

FOLKPHYTOCOENOSIS? PERCEPTION OF VEGETATION TYPES/HABITATS BY PEASANTS IN EUROPE

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The perception of vegetation by peasants and herdsmen was studied in two contrasting landscapes: Csango people in the spruce zone in Gyimes in the Eastern-Carpathians in Romania and herdsmen in the salt steppe region of the Hortobgy National Park in Hungary. 45 and 62 people were interviewed, respectively. Names of wild plant species, and habitat types were collected together with information on their characteristics (e.g. distribution, description, use, habitat preference of species, dynamics of habitats). In the montains more than 130(!) habitat types are distiguished by local people based mainly on their dominant species, land-use and soil conditions. In the salt steppes more than 30 habitat have a local name. Local people name ca. 50-60% of the visible flora of the regions, most of the names relate to the genus level in scientific taxonomy. Great similarity was found between the local and the scientific terminology used to describe habitat preferences of wild plant species, and less similarity regarding habitat names. Some habitat names often turned up in everyday conversations, some are less often used, while others seemed to survive only in geographical names. Data also indicate that most of the habitat-related knowledge is non-verbal. Surprisingly - though local people know well the habitat preferences of nearly all the wild plant species (what sites species X prefers?) they can not list these species if we ask the reverse: what species occur in habitat X. Based on nearly 120 answers we argue, that traditional perception of vegetation is highly different from the phytosociological methodology, where species composition is the key attribute in distinguishing vegetation types.

DARWINCORE ARCHIVE: A NEW TURBOVEG EXPORT FUNCTION FOR SHARING DATA VIA THE GBIF PORTAL

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GBIF (Global Biodiversity Information Facility) enables free and open access to biodiversity data online. It is an international government-initiated and funded initiative focused on making biodiversity data available to all and anyone, for scientific research, conservation and sustainable development. GBIF has currently indexed more than 126 million species records which can be queried through the GBID Data Portal (www.gbif.org). Although the focus of GBIF is on floristic data (and specifically on herbarium data), vegetation data can also be a great source for floristic data. Now that so many local, regional and national vegetation databases have been set up with Turboveg, especially in Europe, the time is there to share data in such a way that European overviews can be made easily. As far the GBIF facility concerns this is only possible on a species level. To make data sharing of the floristic component of vegetation data through the GBIF facility possible, export to DarwinCore Archive will added to Turboveg real soon. DarwinCore covers a limited set of parameters that meanly focuses on WHERE and WHEN a certain species is found. The meta data that comes with the DarwinCore Archive covers information on the data provider, how to cite the data and data ownership.

WOULD NATURA 2000 BE POSSIBLE WITHOUT PHYTOSOCIOLOGY?

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It is difficult to imagine Natura 2000 without phytosociology and phytosociologists; - from the work undertaken prior to the directive being adopted in 1992 to the current focus on managing and monitoring, not forgetting the important work in selecting sites and assessing the network during the many Biogeographical seminars, phytosociology has played an important role.

The 1992 list of habitats to be protected by Natura 2000 (Annex I) was based on the Corine biotopes classification, which relied heavily on phytosociology, as noted in the introduction to the CORINE biotopes manual ("...led us to use as a main reference the basic units of the phytosociological classification of vegetation."). Since 1992 some 50 habitat types have been added to Annex I, but the form used for proposals asks for the syntaxon or syntaxa maintaining the link. Of the 231 habitat types, some two thirds either have a syntaxon in the name and/or mentioned in the description given in the EU Interpretation Manual. The majority of Member States have published more detailed descriptions of the Annex I habitat types present on their territory and, with the exception of the Nordic countries, these national publications make frequent references to phytosociology. But Phytosociology has also gained from the Habitats Directive.

THE GOOD, THE BAD AND THE UGLY: DOES PHYTOSOCIOLOGY DO JUSTICE TO REAL VEGETATION?

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Many phytosociologists distinguish between "typical" or "well-developed" sites on the one hand, and "atypical", "poorly developed" sites on the other hand. More specifically, one might distinguish between (1) relevés which are rich in diagnostic species (the "good" ones), (2) relevés which have only few diagnostic species or which are transitional between two or more units (the "bad" ones), and (3) relevés which have no diagnostic species at all (the "ugly" ones). Especially the last category is sometimes regarded as less valuable and not even worth to be included into the phytosociological system. But is this distinction real or is it a mere artifact of our concepts?

Species differ in their ecological amplitudes, some having broader niches ("generalists"), some having narrower niches ("specialists"). However, diagnostic species do not automatically have narrower niches than non-diagnostic species, nor do they have higher conservation value. In contrary, very rare species are unlikely to be included in diagnostic species lists because of their low frequency. Sites which are poor in diagnostic species may be naturally widespread and may host endangered species all the same. For these reasons, phytosociology needs a classification system without definition gaps and unambiguous assignment criteria for relevés.

A classification without definition gaps can be achieved by using "central syntaxa" which are negatively defined by the absence of diagnostic species. Associations can become sharply bounded by using differential species of high fidelity. However, higher syntaxa are mostly defined by character species with high constancy but rather low fidelity. Therefore, a new method called "summarised percentage cover approach" is proposed. The assignment of individual relevés is based on the summarised cover value of diagnostic species, starting at the class level and proceeding successively to the lower ranks. Unlike some other proposals, the new method allows the unequivocal assignment of almost all existing relevés to one and only one vegetation unit.

20 YEARS OF PHYTOSOCIOLOGY IN JOURNAL OF VEGETATION SCIENCE

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European Vegetation Survey is a working group of the International Association for Vegetation Science. It was founded in 1992 to promote phytosociology and vegetation classification in Europe. Journal of Vegetation Science is the official organ of the International Association of Vegetation Science. The journal was founded in 1990 as a "journal for all vegetation scientists", including phytosociologists (van der Maarel 1990). In my oral presentation, I will analyze how the journal has served phytosociologists in the past 20 years and how the phytosociologist were able to make profit from the journal during its existence.

BOREAL FORESTS OF EURASIA IN CIRCUM-BOREAL VEGETATION MAP (1:7500000)

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The Circum-Boreal Vegetation Map (CBVM) is the example of efforts of international team to show small-scale regularities of the largest biom on the basis of unified approaches of various national phytosociological groups. Some basic principles of vegetation classification applied for the Boreal Vegetation Map of Eurasia as a part of CBVM 1. The structure, physiognomy and ecology of the plant cover. 2. Division vegetation into 2 categories: zonal and azonal types. 3. Biogeographical principle (including vegetation types in zones, subzones and geographical sectors, bioclimatic sectors). 4. Species composition of dominant (highest) layer. 5. Floristic criteria. The characteristic species combinations on the basis of geographical and site variability. Classification of the Braun-Blanquet system. 6. Specific combinations of plant communities. The first level of legend includes largest types of vegetation defined on the basis of structure, physiognomy, ecology of the plant cover and zonality. At the second level, the category of zonal boreal forests is represented by the largest ecological-physiognomic subdivisions, F.1. Boreal dark-coniferous forests (Piceetalia excelsae and Abieti-Piceetalia jezoensis) F.2. Boreal lightconiferous evergreen forests (Pinetalia sylvestris) F.3. Boreal light-coniferous deciduous needle-leaved forests (Ledo-Laricetalia and Lathyro humilis-Laricetalia) F.4. Boreal broad-leaved deciduous birch, aspen and mixed coniferous-birch forests. Brachypodio-Betuletea and Betulo-Ranunculetea) At the third level, the biogeographical principle should be applied. Floristic principle could be applied at this level too because it is closely linked with geographical and bioclimatic criteria. At the forth level, the biogeographical principle of subzonal differentiation of boreal zone could be applied at least for zonal types of vegetation. - Northern boreal coniferous and small-leaved open forests - Middle boreal coniferous forests - South boreal dark-coniferous and mixed forest - Continental hemiboreal forests

MAPPING VEGETATION OF THE KOLA PENINSULA ON THE BASIS OF COMBINING FIELD AND REMOTE SENSING METHODS

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The structure and composition of vegetation cover on the Kola Peninsula northwestern Russia (Imandra lake watershed) have been investigated. The objective of our research is to reveal the features of spatial distribution of ecosystem types due natural and anthropogenic factors. The investigation area (67°55'N, 32°48'E) is located in north taiga zone on the Kola Peninsula. North taiga non-swampy spruce forests are restricted to the best-drained and warmest habitats on slopes and crests of different glacial formations. Besides spruce forests there are pine forests on plains and valleys; peat lands occupy depressions and lake and river beds. At the elevation from 350 to 450-500 m a.s.l. coniferous forests are replaced by crook-stem birch forests. Alpine tundra covers the uppermost parts and tops of hills. This report describes the requirements for application of field and remote sensing methods for creating the statistical cartography model of forests cover. High-resolution (HR) instruments with spatial resolution 25-30 m e.g., Landsat-TM, ETM+ are applied as the main Earth Observation Data. Groups of associations and associations of vegetation are the lowest classification units of vegetation mapping of the study area (S=6500 km²). For their detection, the approach of the ecologophysiognomic classification was used as its characteristics are most acceptable for definition of species composition and structure of plant communities using remote sensing data. Sintaxonomic units embody information on post-fire and post-cutting successions and reflect digression stages of plant communities due industrial damage. On the base of discriminant analysis of vegetation cover state assessment using field data, the remote sensing data and digital elevation model (DEM) were performed the interpolation of forest biodiversity parameters and typological units on total model area. Mapping of current state of vegetation cover (1:100 000) of the central part of the Kola Peninsula is the result of the researches.

VEGETATION ANALYSIS OF THE NORTH AMERICA AND EURASIA ARCTIC TRANSECTS: A TOOL FOR DETECTING LONG-TERM CHANGES FROM SPACE

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Satellite-based observations of vegetation change in the Arctic require groundbased information from across the region to help interpret long-term trends in spectral properties. We collected and analyzed relevé data from two transects that span all five Arctic bioclimate subzones in North America and Eurasia. Along the North America Arctic Transect (NAAT), we sampled 147 relevés at 9 locations in northern Alaska and northwest Canada (68° to 78° N). The Eurasia Arctic Transect (EAT) included 80 relevés at 7 locations on the Yamal Peninsula and Franz Josef Land (FJL) (65° to 81° N). We analyzed floristic and structural vegetation data, biomass, and environmental data for correlations between species and environmental characteristics using ordination techniques. We found a very strong logarithmic correlation (y=24ln(x)+0.6, $r^2=0.91$) between the Normalized Difference Vegetation Index (NDVI; an index of vegetation greenness) and plant biomass that is nearly identical for both transects. We also found that there was less variation in zonal vegetation along the EAT (excluding FJL, which is separated from the rest of the EAT by over 800 km) than along the NAAT. This relative homogeneity is due to the continuous climate-vegetation gradient, similar parent material, and lack of recent glaciation along the Yamal Peninsula compared to the many islands and strong variations in geology and glacial history along the NAAT. Furthermore, extensive reindeer grazing along the Yamal Peninsula probably homogenized the vegetation there. Together, the two transects illustrate trends in plant community composition, structure, biomass, and spectral properties along the full Arctic bioclimate gradient on both continents, as well as inter-continental differences in climate, soils, glacial history and disturbance regimes, that are essential to interpreting the satellite-derived information.

PNV 2.0: FROM TYPOLOGY TO ECOLOGICAL MODEL

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Thanks to its wide use, the concept of potential natural vegetation (pnv) is a phytosociological success story. Managers and planners often require maps of biotic potentials. Criticism of pnv points out fundamental problems in the derivation of units and failure to account for dynamics in environment and vegetation. More fundamentally, traditional pnv mapping must be criticised for being based on correspondences rather than on understanding cause and effect, resulting in narrative rather than scientific models. Pnv is closely related to the display of ecological conditions acting on population and communities of crop plants in site mapping. Thus, forest site types have often been delimited and named as types of natural communities. We propose to update pnv mapping by founding it on explicit models of ecological gradients, which are calibrated by regressing species composition (response) against site variables (dose). There are three new dimensions to this: (1) GIS and spatial modelling provide a tremendous amount of area-wide, high resolution data on climate, soil and relief, (2) new regression techniques allow to model complex dose-response relationships and (3) anticipated changes in ecological factors can be incorporated in scenarios. Ellenberg indicator values summarise the compositional response with respect to defined ecological factors. The response of key species such as trees can be modelled individualistically and overlaid with pnv units. Pnv units are obtained as hypervolumes with known site properties and probabilities of tree species occurrence, which takes them out of the realm of expert opinion and disguised value judgement. It remains crucial to quantify anthropogenic biases in calibration data to avoid and remove distortions by hidden confounders. The procedure is exemplified by the GIS-based mapping of forest types for the Northern Alps in the project WINALP.
LARIX SIBIRICA AND *PINUS SIBIRICA* RESPONSE TO CLIMATE CHANGE WITHIN ALPINE FOREST-TUNDRA ECOTONE OF SOUTH SIBERIAN MOUNTAINS

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The advance of treeline into the alpine tundra and the transformation of mat and prostrate krummholz forms of larch (Larix sibirica Ledeb) and Siberian pine (Pinus sibirica Du Tour) into arborescent form were documented for the southern Siberian Mountains. Larch and Siberian pine considerably increased their radial and apical growth increments during the last few decades. The current treeline surpassed the upper historical treeline was by about 20 m, and the regeneration line by about 90 m. A mean annual 1°C increase in temperature was associated with an upward shift of the treeline by about 80 m. The mean rate of treeline upward migration during the last century was about 0.9 m yr⁻¹. The widespread transformation of mat and prostrate krummholz forms into vertical was observed. An analysis of the radial growth increments showed that these transformations began in the mid-1980s. Larch showed a greater resistance to the harsh alpine environment and attained a vertical growth form in areas where Siberian pine is still krummholz. Observed radial and apical growth increment increases were correlated with increases in summer and "cold period" (i.e. September-May) air temperatures and atmospheric CO₂ concentrations.

SHIFTS IN THE JURA AND ALPINE PLANT COMMUNITIES: TOWARDS MOUNTAIN INTENSIFICATION?

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Shifts in alpine species distribution and vegetation are a current research topic. In this survey the focus has been placed on the evolution of widespread vegetation communities (meadows, grasslands, scrubs and tall herbs) and sentinel vegetation communities like snow patches of Salicetea herbaceae (in the Alps) and humid meadows of Caricetum ferrugineae (in Jura). Two key sectors have been analyzed in the Jura Mountains (High-Chain National reserve of the Jura) and the northern French Alps (National park of the Vanoise). In both places a map was realized forty years ago. The phytosociological map, drawn by Cl. Béguin (1972) in the late sixties, covers the tops of the Jura summits (Cret de la Neige and Reculet); several associations were identified for the first time in this investigation and gave to this territory an undeniable reference value. The map of the National park of the Vanoise was realized with a phytoecological approach (Amandier & Gasquez 1978). Both maps were redone over the last two years. The results show that: - the mesic lawns have largely decreased in the central parts of the pastures ; - high altitude mesic meadows, strongly developed, in these same places ; - scrub and tall herb communities have strongly developed at the margins of these pastures ; - the area of calcareous grasslands has remained stable ; - even though their area has strongly diminished, the average altitude of snow patches is not significantly different from that in the 1970s in the alpine site ; - the number of units and the composition of humid meadows are nowadays nearly the same as in the 70s on the Jura summits. All these findings lead to the conclusion that: - there is a strong intensification in the central parts of high altitude mesic pastures and abandonment in their margins due to changes in grazing practices; in which way still remains to be clarified ; -the sentinel communities, that are not directly under influence of grazing practice, show a good resistance to global warming.

APPROACH FOR A REFERENCE FRAME FOR PLANTS COMMUNITIES IN SWITZERLAND.

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In Switzerland there's no reference that leads to the vegetal associations like in many countries in Europe. Even though, the famous "Guide of natural habitats" published by Delarze & al. (2008) is a widely used by biologists, environmental managers or naturalists, environmental management is located to varying scales. Thus, it is essential to have a hierarchically organized system. This project aims at reference all the vegetal associations in Switzerland to elaborate a database with all the descriptions. It has been presented in Brest (Fr) during the International Symposium of Century of Phytosociology (Prunier & al., 2010). This presentation would specially focus on the methodological tools used for it. The data collection is based on a phytosociological database aimed at compiling all the associations listed in Switzerland, created by R. Pantke, a chemist keen on botany. For each association the list of species characteristics and constants, as well as information on their ecology, biogeography and soil conditions are gathered. From the existing database a matrix species / association can easily be extracted. On this basis, a similarity matrix and hierarchical cluster can also be applied to each table. The hierarchical classification is used to check for each class the relevance and the positioning of basic syntaxa; sometimes a correspond analyse is required, specially for complex syntaxa for which a lot of associations have been described. The specific combinations of different associations and the similarity matrix used to select syntaxa different enough to be considered, according to the associations rules by Bergmeier & al. (1990), Dierschke (1994) and Ellenberg (1996). The selection of vegetation units will be made taking account to environmental conditions and use. The literature of the neighbouring countries, and consultation of various experts, will help confirm these choices and harmonize with the proposed result lists that already exist. Finally, the geographical distribution will be specified based on available literature. An identifying dichotomous key is finally produced.

IMPLEMENTATION OF THE US NATIONAL VEGETATION CLASSIFICATION

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The U.S. National Vegetation Classification Standard is a dynamic process standard for classifying vegetation in an integrated, ecologically-based physiognomic floristic vegetation hierarchy by the Federal Geographic Data Committee (FGDC) Vegetation Subcommittee in 2008. The NVC Standard establishes a process for maintaining and improving individual vegetation classification units over time through the submission and review of proposed changes to the hierarchy and description and adoption of accepted new and revised types. A goal of this effort is to make the process and the resulting classification (NVC) and data transparent and widely available to stakeholders and the general public. To meet the challenges of implementing and maintaining the dynamic process described in the Standard, databases, software tools, and guidelines that support the process are being established by the FGDC and Ecological Society of America's Panel on Vegetation Classification. Here, we will introduce the NVC hierarchy for classification, progress toward building the NVC through a peer review process, and tools being developed for the use of the NVC. A working NVC, with most levels described, will be available by the end of 2011.

VEGETATION OF BOREAL SPRUCE FORESTS AFTER CLEARCUTTING: PROBLEMS OF CLASSIFICATION

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Clear-cutting is a major type of disturbance of Russian taiga forests. The key problem is unification of typology and classification of serial communities of clearing sites.

We examined vegetation diversity and composition of spruce forest clearings in southern taiga of European Russia. The classification of clear-cut vegetation were done according to ecological coenotic and ecological floristic approaches. The database of 620 phytosociological relevs were used. We determine 14 associations (Cl. *Vaccinio–Piceetea* - 4 ass., Cl. *Querco–Fagetea* - 2 ass., Cl. *Alnetea glutinosae* - 2 ass., Cl. *Epilobietea angustifolii* - 4 ass., Cl. *Molinio–Arrhenatheretea* - 2 ass.) on the basis of results of relevs classification, ordination by plots and species and comparative analysis of ecocoenotical species clusters with phytosociological indicator species groups. Ordination diagram with regions of determined associations was combined with forest associations at edaphic phytocoenological scheme by V.N. Sukachev.

Vegetation changed incidentally in moist patches like pure forest bogs (ass. *Rubo chamaemori–Piceetum* and *Sphagno girgensohnii–Piceetum*) and forest swamps (ass. *Climacio–Piceetum, Carici elongatae–Alnetum medioeuropaem* and *Alno incanae–Piceetum abietis*). Vegetation had different pathways against intensity of logging disturbance of vegetation and soil in mesic habitats (ass. *Eu–Piceetum abietis, Querco–Piceetum* and *Rhodobryo rosei–Piceetum abietis*). The meadows (Cl. *Molinio–Arrhenatheretea*) or tallherbs communities (Cl. *Epilobietea angustifolii*) were formed after heavy disturbances.

SYNTAXONOMY OF VACCINIUM MYRTILLUS COMMUNITIES IN PENINSULAR ITALY

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The Italian distribution of the species belonging to the genus Vaccinium exhibits a sharp decreasing trend moving southwards. In the Alps there are various Vaccinium species (Vaccinium myrtillus, Vaccinium vitis-idaea, Vaccinium gautherioides, *Vaccinium microphyllum*) which characterise many environmental types such as heathlands grasslands, coniferous woods undergrowth, bogs etc. On the contrary Vaccinium species become rarer in the Apennines where the southernmost limit of the genus is located in southern Abruzzo. In the northern Apennines both Vaccinium myrtillus and Vaccinium gaultherioides are common and form huge communities within the upper montane belt such in particular Hyperico richeri-Vaccinietum gaultherioidis and Empetro-Vaccinietum gaultherioidis, while Vaccinium vitis-idaea is rare and restricted to few sites where more continental conditions occur. In the central Apennines Vaccinium gaultherioides is extremely rare and restricted to two populations occurring in the Gran Sasso-Laga National Park. Vaccinium myrtillus occurs in various mountainous massifs but it is only in the Laga mountains (pelithic-arenaceous massif) that this species behaves as the dominant species in the heathlands of the montane and subalpine belts as well as in the undergrowth of beech woodlands (Prenantho-Fagetum vaccinietosum myrtilli). The different Vaccinium mirtyllus communities have been identified in the Laga Mts. were related to the different altitudinal belts, Pedicularido tuberosae-Vaccinietum (subalpine), Sileno ciliatae-Vaccinietum (upper montane), Vicio variae-Vaccinietum (lower montane). In the rest of the central Apennines Vaccinium myrtillus is very rare due to the calcareous nature of the substrates. Nevertheless there are some areas in which typical Vaccinium myrtillus stands were identified and syntaxonomically described. This is the case of Junipero-Vaccinietum in the subalpine belt of Mount Terminillo and Luzulo sieberi-Vaccinietum of Mount Coscerno. As far as the higher-rank syntaxa is concerned the primary microthermic low-heathlands of the subalpine belt belong to Loiseileurio-Vaccinetea, the mixed Vaccinium-Juniperus secondary communities of montane belt to Vaccinio microphylli-Juniperetalia nanae while the lower montane belt heathlands to Calluno-Ulicetea.

USE AND ABUSE OF THE CORINE BIOTOPES SYSTEM NOMENCLATURE: EXAMPLES FROM THE NATURE MAP OF LAZIO REGION

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A Geobotanical approach to the description of vegetation units can be provided by using classes from the Corine Biotopes nomenclature system. In Italy this choice characterize the national program for mapping vegetation using a common reference and language for all the Italian ecosystems (Nature Map of Italy). Braun Blanquet nomenclature doesn't have a unique reference for the Italian units and this represents a limit for a shared output map to be produced at national level. The use of the Corine Biotopes legend, nevertheless and taking into account the intrinsic structural bias due to the heterogeneous definition criterion, allowed to reach a starting point that is a map at the 1:50.000 scale of the entire territories of Italy. This map has been processed by authomatic classification in order to provide Quality maps, useful in land managing and planning. The results reported for the Lazio region show limits and positive goal reached through this approach.

SHIFTING BASELINES WITHIN THE SPECIES COMPOSITION OF MESO- AND POLYHEMEROBIC VEGETATION COMPLEXES

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In animal and plant systematics, a hierarchical classification has been accepted as a useful tool in order to characterize evolutionary trends between closely related species in contrasting habitats. Vegetation ecologists have principally adapted this approach for the classification of plant communities and their variation within differently used and geographically separated areas. The shift of the species composition as a result of an increasing intensity of the land use seems to be stronger and faster than evolutionary adaptations of the species involved. The increasing influence of the land use intensity leads to a shift of the species composition of plant communities especially in intensively used rural landscapes. For landscape management and nature conservation issues, a comparison of vegetation analysis on selected permanent plots compared with the abiotic site conditions offer an understanding of the key processes concerning the preservation and management of endangered species and ecosystems. This will be exemplified by key studies from oligohemerobic mire sites and polyhemerobic rural areas in Central Europe. In practice, the most sensitive and specialized plant species are fairly good indicators for defined close environmental conditions, for instance the specialists and csr-strategists in the classification of Grime, while competitive ruderals (r- and c-strategists) are less hampered. On a long run, in a hierarchical organized classification system, the sensitive indicators disappear first, while weedy species with a broad ecological amplitude increase in importance.



POSTER

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LONG-TERM DIVERSITY CHANGES IN MOLINION MEADOWS: A CASE STUDY USING A LARGE DATASET FROM THE POLISH VEGETATION DATABASE

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Over the past 100 years, a large number of phytosociological relevés has been collected in many European countries using the Braun-Blanquet method. The data collected represent a valuable resource, especially since the development of electronic databases, statistical tools and new biocenotic indicators.

The Polish Vegetation Database contains over 25107 phytosociological records stored in TURBOVEG. Of these, 1744 relevés represent Molinion meadows from different parts of Poland, collected between 1927 and 2010. Three basic approaches were used for stratified resampling: 1) by traditional phytosociological associations; 2) by numerical classification; and 3) by defined plot size. In all, 1255 relevés confirmed as belonging to the phytosociological alliance Molinion were subjected to further analysis. The data set was divided into five time periods: (I) 1927 - 1957; (II) 1958 - 1974; (III) 1975 - 1994; (IV) 1995 - 2003; and (V) 2004 - 2010. The time periods were selected according to land management practices and economical changes in Poland. Sixty relevés from each period were randomly selected and resampled using the JUICE software package. All were then analyzed with a focus on diversity changes in meadows during the last 80 years. Indices calculated included Species Richness, the Shannon-Wiener Index, Ellenberg indicators, and the Disturbance Index. Relationships between the indices were determined, and several indices were derived that describe the species composition and species diversity of plant communities in terms of vegetation structure and floristic composition. Differences between mean values for diversity indices and ecological indicators were estimated using non-parametric analysis of variance with the Kruskal-Wallis test. Important changes in species diversity were found during all of the time periods. Some species disappeared or had reduced cover, while others had increased cover, especially woody plants and alien species. Species richness and diversity have changed, although Molinion meadows remain the same syntaxon.

NATIVE SPATIAL DISTRIBUTION OF NORWAY SPRUCE (PICEA ABIES L.) IN CROATIA, AS A FUNCTION OF GEOMORPHOMETRICAL VARIABLES

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Norway spruce (Picea abies L.) in Croatia, as a component of native vegetation, can be found in two altitudinal belts: 1) altimontane belt, where it is a part of widespread mixed (coniferous/deciduous) forests with domination of common beech (Fagus sylvatica L.) and European silver fir (Abies alba L.), or it forms monodominant forests (mostly in terrain depressions with stagnation of cold air and increased humidity), and 2) subalpine belt, where it alternates with common beech and mountain pine (Pinus mugo Turra) at the alpine tree line. An assumption that spatial distribution of Norway spruce in Croatia is dominantly (under relatively homogenous lithological substratum represented by karst limestones) controlled by relief parameters (which strongly influence thermic, humidity and edaphic conditions) was tested in this research. Data set for the analysis (450 occurrences) was derived from data on current distribution of Norway spruce in Croatia (Flora Croatica Database) with paying attention to exclusion of antropogenous sites. Geomorphometrical variables were derived within the frame of a raster geographic information system from digital elevation model (spatial resolution of $30 \times 30 \text{ m}$), including: altitude (i.e. digital elevation model itself), terrain slope and curvature, solar irradiation (with separation of direct and diffuse component), exposure to wind and depth of karst sinkholes. These independent estimators were used for quantification of ecological (geomorphological) niche of Norway spruce in Croatia.

STATUS OF ROADSIDE LIME STANDS IN SAINT-PETERSBURG (NORTH-WEST RUSSIA)

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Research base on data, obtained from 332 model lime trees (*Tilia cordata* Mill.), measured on sample plots of roadside vegetation in 2007.

The following parameters were measured: the distance from the edge of the carriageway to tree trunk, age of the tree, tree height, diameter at a height of 1.3 m; vitality class (using 6-point grade); frost resistance (using 6-point grade), the aesthetic state (3 levels), injuries and some other indicators.

Vitality class analysis of the lime stands showed that at roadside stands dominated by a heavily-weakened (class 4) and weakened (class 3) trees. At the same time at a distance of more than 30 meters from the road is no trees severely weakened. This suggests that these plantations are located in more favorable conditions than the roadside landing.

Most of the heavily weakened trees found on the dividing strips of the roads, which was observed thinning and drying of the upper crown, premature defoliation and drying of leaves and water sprouts on the trunk, developing from dormant buds, which is an indication of weakening of the upper part of the plant. Vertex type of weakening the trees can be caused by either damage to crowns of pests and diseases or adverse human factors, which in turn reduces insect-resistance of the trees.

Mathematical and statistical analysis of vitality of lime stands depending on distance from the edge of the roadway showed a fairly high inverse relationship: the distance from the roadway condition improves lime: R = -0,71, p < 0,0001.

Linear regression equation, drawn from these data is as follows: vitality class = -0.087 + 3.085 * distance.

The results of survey also shows cold and frost resistance of *Tilia cordata* in typical conditions in St Petersburg and the main hampered factor of this genera in region is pollution pressure.

The results of salinity-resistance analysis showed that *Tilia cordata* is classified as unstable tree genera to salinization. Analysis of data on salinity showed that high salt content does not have too detrimental effect on vegetation, are far enough away from the carriageway (no closer than 3-4 meters). It was also conclude that the probability of tree mortality is significantly reduced if they planted no closer than 9 m from the edge of the carriageway.

The main reasons for the deterioration of small-leaved lime trees on the Moscow prospectus include: (1) lack of smoke-gas-resistance and (2) its instability to salinity.

In the future we plan to continue similar studies on other species of plants that would develop a stable range for roadside stands.

CLASSIFICATION AND DISTRIBUTION PATTERNS OF PLANT COMMUNITIES ON SOCOTRA ISLAND, YEMEN

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The Socotra archipelago is located 380 km south of Ras Fartak on the Gulf of Aden coast of Yemen and 230 km east of Cape Guardafui in Somalia. It is of continental origin and was joined to the Arabian plate prior to the rifting of the Gulf of Aden (15-35 Myr ago). Its long geographical isolation is responsible for the high level of endemism: Socotra archipelago hosts 837 species of vascular plant flora, of which 308 are endemic. Socotra's isolation lasted until the beginning of the 1990s, when many development projects such as the construction of an airport, sea port and asphalt roads got underway. These changes and the effect of climate change are increasing the pressures on plant species, many of which are now threatened with extinction. The identification of plant communities and their distribution patterns is important for the development and implementation of management strategies. This study aimed to fill this gap by providing a first comprehensive phytosociological analysis of the main plant communities and their distribution. 318 relevés were established along an altitudinal gradient in each habitat type. Floristic and ecological (topographic, geological and climatic) data were collected and analysed using hierarchical classification and NDMS ordination, which also included an analysis of the correlation between plant communities and environmental factors. Hierarchical classification identified seven types of woodland, seven of shrubland, six of grassland and eight of halophytic vegetation. Ordination revealed the importance of altitudinal and climatic gradients, as well as of geological categories. Four vegetation belts have been identified. The first three are located in the arid region from 0 to 1000 m and the forth in the semi-arid region from 1000 to 1500 m. Specifically they are: 1 an arid coastal plain mainly located on an alluvial substratum between 0 and 200 m, characterised only by shrubland and grassland communities; 2 a transition zone from 200 to 400 m, between the alluvial substratum and the upper limestone area; 3 an arid limestone belt between 400 and 1000 m, interspersed with hills and plateaus; 4 a semi-arid upper zone of the Haghier mountains from 1000 to 1500 m on a granitic substratum. One hygrophilous woodland and eight halophytic communities have an azonal distribution.

ABOUT THE TAMARICION TETRAGYNAE ZOHARY 1947 ALLIANCE IN THE EASTERN MEDITERRANEAN

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In the Mediterranean Region, the mature stages of salt marsh vegetation are represented by *Tamarix* dominated communities. These saline habitats, as well as the species growing there, are developed under xeric climate conditions. The annual rainfall average is usually lower than 350mm.

Some important floristic differences can be found in these habitats alongside the Mediterranean.

In the Western Mediterranean, only a few *Tamarix* species are dominant in salt marshes: *T. boveana, T. canariensis* and sometimes *T. africana.* These communities are included into the *Tamaricion boveano-canariensis* Izco, Fern.-Gonz. & A. Molina 1984 Alliance (*Nerio-Tamaricetea* Br.-Bl. & O. Bolòs 1958).

In the Eastern Mediterranean the amount of *Tamarix* species represented is slightly higher: *T. nilotica*, *T. tetragyna*, *T. passerinoides*, *T. hampeana* and *T. aphylla*.

Some authors have studied these kind of communities in the Eastern Mediterranean (Eig, 1947;Zohary, 1973; Zohary & Orshansky, 1949; Hamzaoglu & Aksoy, 2006; Karaömerlioglu, 2007). In most of these studies, the *Tamarix* communities have been included in vegetation classes originally described for shrub or perennial grassland halophylous vegetation: *Suadetea deserta* Zohary 1973 (Zohary, *op. cit.*), *Salicornietea fruticosae* (Hamzaoglu & Aksoy, *op. cit.*), *Juncetea maritimi* Br.-Bl. in Br.-Bl., Roussine & Nègre. 1952 (Karaömerlioglu, *op cit.*).

Zohary (1947) described the *Tamaricion tetragynae* alliance, in which he first included some *Tamarix* communities distributed around the Dead Sea.

In this poster, a phytosociological review of salt marsh *Tamarix* dominated communities is presented. Some associations have been typified. The results are based in both bibliographic search and our own data collected. Due to the complicated taxonomy of *Tamarix*, is not easy to present an accurate syntaxonomy for these communities. The taxonomic criteria followed has been the one generated in the last years by our research group, with the resources provided by the research project "Taxonomy, systematics and phylogeography of the Mediterranean *Tamarix* species" (CGL2008-05056).

MIDDLE FLOODPLAIN MEADOWS AT ZVENIGOROD BIOLOGICAL RESEARCH STATION (RUSSIA): A SYNTAXONOMICAL AND ORDINATION ANALYSIS

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In the second half of the 20th century, floodplain meadows in the territory of Zvenigorod Biological Station (Russia, Moscow Province) were subject to grazing, mowing, recreation and plowing. At present, they are mostly used for recreation and moderate grazing.

The aim of our work was to assess the communities' diversity and to reveal the factors that define their structure, using syntaxonomical methods and ordination. We have analysed 17 meadow relevés made in the central part of the Moskva River floodplain. A syntaxonomical analysis was based on Braun-Blanquet approach. Ordination by Detrended Correspondence Analysis (DCA) referred to Ellenberg's ecological scales for axis identification, i.e. light, soil moisture, soil reaction and nitrogen supply.

A classification scheme is given to outline the results of our syntaxonomical analysis. Three associations and three communities have been classified into three alliances: *Festucion pratensis*, *Cynosurion* and *Aegopodion podagrariae*; they represent two classes, *Molinio-Arrhenatheretea* and *Galio-Urticetea*.

The first two axes of DCA explain about 30,3% of the total variance of species composition among the studied communities. An ordination of the relevés along the first two axes of DCA has revealed a strong gradient of abiotic factors (light, moisture and nitrogen supply) along the first axis, while anthropogenic disturbance was the main factor at work along the second one. The abiotic factors appear to contribute to the species composition of the meadows more than the anthropogenic disturbance. Along the first axis, the vegetation changes from the poorest in nitrogen and driest types of the alliance *Cynosurion* through a rather moderate alliance *Festucion pratensis* to the *Aegopodion podagrariae* alliance representing the moistest, richest and most shaded conditions. Along the second axis, the vegetation changes from the alliance *Cynosurion* that suffer grazing, recreation, and bear certain effects of the past-time plowing, to the least disturbed community of the alliance *Festucion pratensis*.

SUBALPINE TALL-GRASS AND TALL-FORB COMMUNITIES (CALAMAGROSTIETALIA VILLOSAE) IN UKRAINIAN CARPATHIANS

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The subalpine tall-grass and tall-forb communities in Ukrainian part of Eastern Carpathians were poorly documented so far. Data from this area were unknown for wide range of researches and have not been included into a largescale survey. Syntaxonomical positions of these communities are still ambiguous.

The main goals of the study were to investigate the diversity of *Calamagrostietalia villosae* communities in various geological and geomorphological units of Ukrainian Carpathians with different land-use history and to compare the results with studies made in neighboring countries. The syntaxonomical revision was performed including newly sampled and historical published data, about 350 relevés in total. Data were analyzed using JUICE (Tichy, 2002) software.

Communities from the alliances *Calamagrostion villosae*, *Trisetion fusci*, *Calamagrostion arundinaceae*, *Festucion carpaticae*, *Adenostylion alliariae* and *Rumicion alpini* are distinguished. Correlation with environmental factors was investigated using canonical correspondence analysis (CCA). Subalpine tall-grass vegetation in Ukrainian Carpathians is quite various, nevertheless is poorer than in Slovakia and Romania.

THE EUROPEAN DRY GRASSLAND GROUP (EDGG), A VIGOROUS OFFSPRING OF EVS: CURRENT STATUS AND OVERVIEW OF ACTIVITIES

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The *European Dry Grassland Group* (EDGG), an IAVS working group since autumn 2009, as of 24 January 2011 had 586 members from 48 countries. EDGG is a network of dry grassland researchers and conservationists, covering all dry grassland-related aspects from vegetation science, via botany, mycology, zoology, soil science, and landscape ecology to conservation, restoration, and agriculture. EDGG is governed by an Executive Committee of four members (the authors of this poster) and has no membership fees. Presently, four regional subgroups have organised themselves within EDGG: the German *Arbeitsgruppe Trockenrasen*, the *Working Group on Dry Grasslands in the Nordic and Baltic Region*, the *Working Group on Mediterranean Dry Grasslands* (Med-DG), and the *Southeast European Dry Grassland Group* (SEEDGG).

In 2010, the major activities of the EDGG were:

- 7th European Dry Grassland Meeting in Smolenice, Slovakia, 27 May 1 June, attended by 100 grassland scientists from 20 countries
- 2nd EDGG Research Expedition to Central Podilia, Ukraine, 10–25 July, attended by 18 grassland scientists from 8 countries
- Publication of issues 6 to 9 of the quarterly Bulletin of the European Dry Grassland Group (ISSN 1868-2456, see http://www.edgg.org/publications.htm)
- Publication of the Smolenice Grassland Declaration (available from and to be signed at http://www.botanik.uni-greifswald.de/574.html)

Two Special Features for international journals (*Plant Biosystems* and *Tuexenia*) with contributions from the conference in Smolenice are presently in preparation.

The next EDGG events are:

- 8th European Dry Grassland Meeting in Uman', Ukraine, 13–17 June 2011. Topic: Dry grassland of Europe: biodiversity, classification, conservation and management. Homepage: http://www.edgg.org/edgg_meeting_2011.html
- 3rd EDGG Research Expedition to mountains in NW Bulgaria, 14–24 August 2011. Contact: Iva Apostolova (iva@bio.bas.bg) and Jürgen Dengler (see below).

Further information on EDGG can be found on our homepage at www.edgg.org. If you wish to join EDGG, just send an e-mail to the membership administrator, Jürgen Dengler (dengler@botanik.uni-hamburg.de).

INCLUDING BRYOPHYTES PROVIDES A NEW PERSPECTIVE ON THE SYNTAXONOMY OF THE THEROPHYTE-RICH COMMUNITIES OF TRAMPLED HABITATS (*POLYGONO-POETEA ANNUAE*)

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The class *Polygono-Poetea annuae* comprises the communities of trampled habitats that are dominated by therophytic vascular plants and bryophytes. Various classifications have been proposed for this class, but their validity is limited as hardly ever bryophytes have been treated adequately despite the fact that they are a central part. Further, only rarely the variation in species composition has been related to measured environmental parameters. We analysed the *Polygono-Poetea annuae* communities of Hamburg as a case study for these widespread azonal vegetation types and compared our results with literature data from other parts in central Europe.

We found that bryophytes are indeed an integral part of these communities, contributing approx. 1/3 to the overall richness and more than 40% to the average cover. Other studies that treated bryophytes often only recorded *Bryum argenteum* and *Ceratodon purpureus*, while according to our study also *Bryum bicolor* agg., *Barbula unguiculata*, *B. convoluta*, *Pseudocrossidium hornschuchianum*, *Marchantia polymorpha* subsp. *ruderalis* and *Lunularia cruciata* are so frequent and so preferential for trampled habitats that they can be considered as character taxa of the class and its subordinate units.

Regarding the compositional pattern we found the strongest gradient between bryophyte-poor stands with much *Polygonum arenastrum* on dry, sunny places to bryophyte-rich stands with Sagina procumbens in moist to wet, shady places. Therefore, unlike previous classifications, these two groups should be ecologically floristically considered as and well-founded alliances (nomenclatural treatment still pending). While most of the lower-rank units delimited by us correspond to previously described associations, is one rather widespread association from the second alliance without such a counterpart in the literature and likely needs to be described as new to science. Within the class, this association is better characterised than any other unit, and the fact that it has not been published previously might be due to the fact that other researchers avoided bryophyte-rich stands.

DIVERSITY PATTERNS AND CLASSIFICATION OF DRY GRASSLANDS (FESTUCO-BROMETEA) IN THE TRANSYLVANIAN BASSIN (ROMANIA)

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

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

We will present a preliminary proposal, in which higher syntaxonomic units (alliances, orders) to place the Transylvanian communities, based on statistically established (phi values) diagnostic species.

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

SCALE-DEPENDENT PLANT DIVERSITY PATTERNS OF LANDSCAPES IN NORTHERN GERMANY ASSESSED WITH A NEW APPROACH

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Our aim was to measure the average plant species richness for all plant groups (vascular plants, bryophytes, lichens, including non-terricolous taxa) and to characterise plant diversity pattern different spatial scales, using a new standardised approach.

For this purpose, we selected two contrasting landscapes in the North German Lowlands, namely the area (126 km²) of the topographic map sheet 2728 (Lüneburg) in Lower Saxony, NW Germany (ca. 35% forest, 10% grassland, 30% arable land, 25% settlement), and a sector of 6 km² of the topographic map sheet 3049 (Brodowin), Brandenburg, NE Germany (ca. 50% forest, 25% grassland, 20% arable land, 5% settlement). Within both landscapes, we placed series of nested plots randomly and irrespectively of homogeneity with the help of a GPS (50 in Lower Saxony, 16 in Brandenburg). In each of these series, we recorded all species (shoot presence) of vascular plants, bryophytes, and lichens on plots of 0.0001 m², 0.0009 m², 0.01 m², 0.09 m², 1 m², 9 m², and 100 m² size.

In Lower Saxony, we found an average of 1.6 species on 1 cm², 8.5 species on 1 m², and 38.7 species on 100 m² (range: 2–137). The values for Brandenburg were consistently higher for all spatial scales (by 4–29%). Non-vascular plants contributed significantly to the overall plant diversity in both regions and at all spatial scales. On 100 m², for example, bryophytes constituted 15% and lichens 11% of average plant species richness. The most frequent plant species in both study areas and at all spatial scales except 1 cm² was the moss *Brachythecium rutabulum*, which occurred in more than 80% of all 100 m² plots.

We conclude that our flexible approach allows for objective comparison between differently structured landscapes and between various geographic regions. The approach is particularly promising in analysing biodiversity patterns simultaneously on multiple spatial scales and thus being capable of detecting relationships of diversity parameters to predictor variables that change direction with spatial scale.

Dengler, J. (2009): A flexible, multi-scale approach for standardised recording of plant species richness patterns. Ecological Indicators 9: 1169-1178.

PICEA ABIES-DOMINATED FORESTS IN SLOVENIA

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The all relevé material was selected in a way that forest with dominance of spruce (Picea abies): cover of spruce should exceed 25% (cover value 3 in Braun-Blanquet scale) and at the same time the relevés dominated by beech were eliminated. The dataset was stratified (we took maximum of 10 relevés of each association, taking into account the maximum spatial distribution and various authors). Classification revealed two major groups of spruce forests. The first match with Piceetalia excelsae (Piceion excelsae) forests found of nutrient poor substrate, that can be further divided into two subgroups one of high altitudes and the other one on lower ones. The other group that contains mesophilous, species rich communities found mostly on carbonate bedrock can be classified within the *Athyrio-Piceetalia* (Abieti-*Piceion*). This group can be divided into three subgroups, one containing forest from more propitious sites, mainly secondary (in this group we can find also Adenostylo glabae-Piceetum that is often classified as *Chrysanthemo-Piceion*); a subgroup of communities found in frozen hole and a subgroup found on blocks of stones. We also compared structural and geomorphologic features, ecological circumstances estimated by bioindicator values and horotypes of individual clusters. The analysis confirm the above mentioned differentiation: high mountain acidophilus forests posses the lowest pH value, are poor in nutrients, has no bare rock on the ground, the highest number of circumboreal species; lowland acidophilus forests have the lowest cover of herb layer/low light value (the closest canopy), the highest number of central-European species; mesophilous forests of propitious, carbonate sites have the highest soil reaction, highest light availability, highest number of mediterranean-montane species; forests in frozen holes posses the lowest cover of canopy, the higher cover of mosses; and forests on blocks have the highest cover of shrub layer, the lowest moisture value, the highest value of southeuropean oreophytes.

THE APPLICATION OF SATELLITE PHOTOGRAPHS FOR DETERMINATION OF POTENTIAL *LOBELIA* VEGETATION HABITATS

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Lobelia vegetation of the Littorelletea uniflorae class, of the alliances Isotion lacustris and Lobelion, occurs extrazonally, mainly in the north-western part of Poland. It is connected with a deeper zone of the littoral and a sandy floor of the littoral zone of soft-water, oligotrophic lakes, and less often of mesotrophic water bodies. It belongs to most endangered elements of the Polish plant cover due to its large sensitivity to anthropogenic impact, relating directly not only to these water bodies but also to those situated within their drainage basins. Despite many data about distribution of the species being characteristic of the communities of lobelia lakes, their new sites are still being discovered. In order to examine more complete understanding of communities and distribution of species being characteristic of them, an attempt was made to map out their potential habitats using Landsat TM-7 satellite photographs. For examination, the species being characteristic of the associations of the alliances Isotion lacustris and Lobelion, occurring within the area of Pomerania (NW Poland), were chosen. They are as follows: Littorella uniflora, Lobelia dortmanna, Isotes lacustris and Myriophyllum alterniflorum. A database was created for these plants, based on available published, unpublished, herbarium and own floristic data. This database was used to map out an area with the concentration of sites with lobelia vegetation. Next, satellite images taken in 1999-2003 were analysed in respect of the optical parameters of lakes since they largely reflect the water trophy. As a result of this analysis, it turned out that the sites of examined species are concentrated in water bodies with similar optical parameters. This allows preliminary classification of the lakes being a potential habitat for development of lobelia vegetation for examination. This constitutes an important amenity for researcher in land exploration, mainly because these lakes are most frequently small in size and located in a hard-to-reach area.

BIOCLIMATIC MAPS OF THE IBERIAN PENINSULA AND BALEARIC ISLANDS

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Bioclimatic maps of the Iberian Peninsula and Balearic Islands carried out by means of the analysis of parameters and bioclimatic indices of 1281 weather stations according to Rivas-Martínez et al. (2007) (Itinera Geobotanica 17) are presented in this study.

They represent 2 Macrobioclimates (Mediterranean and Temperate), 8 Bioclimates, 2 Bioclimatic Variants, 12 Thermotypes, 7 Ombrotypes and 9 levels of Continentality.

RELATIONS BETWEEN FLORISTIC RICHNESS AND SPATIAL STRUCTURE OF VEGETATION

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The development of management plans for several protected areas (SIC) in the Province of Sondrio has meant that specific evaluations of the distribution and scientific value of flowering plants have been conducted. Previous available information were found to be relatively scarce and heterogeneous; on the other hand, the time to complete the report was limited. Therefore, an indirect approach to the problem was adopted; i.e., the available vegetational data for each type of habitat were used to characterize the species richness and composition for that habitat. Using standard indices reported in the literature, the 'value' of each habitat was then estimated and subsequently, a map of the floristic value of each area (SIC) was produced. This method proved to be efficient and useful; however, the resulting maps should be considered provisional pending further validation in the field and the additional of more accurate information. Several intrinsic characteristics of these habitats were also identified, mainly deriving from structural differences and diversity of related microenvironments. In particular, it is possible to identify correlations between floristic richness, amount of cover provided by each structural component and spatial heterogeneity; in fact, the combination of these parameters permits the definitive characterization of each plant community studied here.

FUNGAL DIVERSITY IN RELATIONSHIP TO VEGETATION ZONES OF TENERIFE (CANARY ISLANDS)

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Knowledge about fungal diversity scaling relationships relative to that of plant communities is important to understand ecosystem functioning. Tenerife Island, a natural laboratory to study terrestrial biodiversity, is represented by six different vegetation zones characterized by specific abiotic conditions and plant communities with a high proportion of endemic plants. Little is known about the biodiversity of associated fungi. To understand the relationship between plant and fungal communities, we analysed soil/rhizosphere fungi from all major vegetation types. From 12 sampling points dispersed on the whole island, molecular analysis of fungal communities was determined by single-strand conformation polymorphism (SSCP) analysis using universal and specific primers for Trichoderma. The highly diverse fungal communities were mainly characterized by ectomycorrhiza-forming Basidiomycota and a high proportion of yet-unidentified species. Besides, Trichoderma-specific SSCP resulted in low diversity of mainly cosmopolitan species, for example Hypocrea lixii/Trichoderma harzianum without ecological correlation. In contrast, biodiversity patterns of the whole fungal communities follow the same ecological rules like the plant communities. Furthermore, a high statistical correlation between fungal communities and the main environmental factors, temperature and precipitation, was found.

FLORISTICAL AND VEGETATION SURVEY ON THE EAST PART OF THE GREAT HUNGARIAN PLAIN (W ROUMANIA)

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Floristical and vegetation survey was carried on the east part of the Great Hungarian Plain (the lowland parts of Partium and Banat – Bánság regions: Arad, Timiş – Temes, Bihor – Bihar and Satu Mare – Szatmár counties) in 2009 and 2010. The investigation was made for the request of Milvus Group. The most important plant species that were found are e.g. Adonis vernalis, Ajuga laxmannii, Anchusa barrelieri, Asplenium adiantum-nigrum, Aster sedifolius, Bupleurum affine, Campanula bononiensis, Carduus hamulosus, Carex pseudocyperus, Chamaecytisus virescens, Chrysopogon gryllus, Cirsium Clematis integrifolia, Dianthus collinus, brachycephalum, C. furiens, Eriophorum angustifolium, Euphorbia glareosa, Geranium sanguineum, Inula ensifolia, I. germanica, I. helenium, I. hirta, Iris spuria, Lathyrus lacteus, L. latifolius, Linum hirsutum, Lotus angustissimus, Lythrum tribracteatum, Kochia prostrata, Marsilea quadrifolia, Nepeta pannonica, Peucedanum carvifolia, P. officinale, Phlomis tuberosa, Plantago schwarzenbergiana, Pseudolysimachion longifolium, Prunus fruticosa, Pulmonaria mollissima, Sedum caespitosum, Silene bupleuroides, Sonchus palustris, Stipa capillata, Stratiotes aloides, Thlaspi alliaceum, Trapa natans and Trifolium subterraneum. Important habitats of the region are e.g. the Pannonic loess steppic grasslands nemorosae-Festucetum (Natura2000 code: 6250) (Salvio rupicolae association) and the Pannonic salt steppes and salt-marshes (Natura2000 code: 1530) (Artemisio santonici-Festucetum pseudovinae, Camphorosmetum annuae, Plantagini tenuiflorae-Pholiuretum pannonici, Achilleo setaceae-Festucetum pseudovinae, Peucedano-Asteretum sedifolii etc. associations). The occurrence of the Pannonic loess steppic grasslands habitat was not accepted in Roumania. Valuables vegetation was found often on the pastures and valleysides, also in old cemeteries and on the roadside and railway verges Based on the field work 124 very important new area were proposed to Natura2000 site. I am grateful to István Kovács, Attila Nagy, Grégory Dhainaut, Kinga Tóth, Thomas Kuhn, András János Csathó and Réka Kis for their help with the current work.

THE NEW FOREST ATLAS OF UMBRIA REGION: A MEETING POINT BETWEEN FOREST SCIENCE AND PHYTOSOCIOLOGY

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The new Forest Atlas of Umbria Region is a work in progress, funded by the Forest Service of Umbria Regional Office, aimed at developing an integrated approach by crossing the basic methodologies of forest science and phytosociology. Its object is to point out similarity and differences between two sometimes divergent approaches to forest vegetation. distinct. Α phytosociologic study, including a bioclimatic and geologic characterization, was carried out in 6 randomly selected sample areas, each corresponding to 1/16 of a mesh of the European grid (scale 1:10.000, about 5x4,5 km²), all located in Central Italy. The same areas were separately investigated with regard to the forestry management, considering dominant species, structure, physiognomy, stage of growth, coppice cycle length. On account of their different ecological conditions and management, the areas offer a wide survey on the forest diversity of Central Apennine and Pre-Apennine. Thematic, geographically referred maps were produced and their data confronted, in order to find out if and how the different management affects the floristic composition and the vegetational type. For each pointed out forest type, an illustrative record, including photos and a floristic, vegetational, ecological and sylvicultural characterization, has been produced and will be part of the Atlas together with the maps. The investigated vegetational types have been referred to the following alliances and suballiances: Laburno-Ostryenion carpinifoliae (Ubaldi 1995) Blasi et al. 2004, Lauro-Quercenion pubescentis Ubaldi (1988) 1995, Teucrio-Quercenion cerris Blasi et al. 2004, Cardamino-Fagenion sylvaticae Biondi et al. 2002, Doronico-Fagenion sylvaticae (Ubaldi et al. ex Ubaldi 1995) Di Pietro et al. 2004, Pulmonario-Carpinenion betuli Biondi et al. 2002, Fraxino-Quercion ilicis Biondi et al. 2003, Alnenion glutinosoicanae Oberd. 1953. Through this experimental development of an integrated sylvicultural/phytosociological protocol for the forest vegetation survey, we could also evaluate costs, duration and benefits of such a project, when extended to the whole regional territory.

CRITICAL ELEMENTS TO GEOREFERENCE NATURAL HISTORY DATA: CALL TO DEVELOP A COMMON APPROACH IN ITALY

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The increasing availability of data on plant and animal biodiversity constitutes a great resource for biological research. Great amounts of data are stored in natural history museums, herbaria and scientific reports, but they are not easily accessible if they are not made available in a digital form. A recognized problem in the digitization of data is that, in most cases, the data location is provided through a textual description which cannot be used directly for digital mapping. Moreover, georeferenced data, when available, are usually recorded without accuracy, they are not standardized and not well documented. Thus, these factors make difficult to combine sets of data and compare the quality of georeferences. These problems have been recently recognized in international contexts, and some solutions have already been proposed. A set of rules were suggested for the conversion of textual descriptions into simple spatial objects which represent the spatial location of the observation and the uncertainty estimate (see e.g. the point radius methods). At least four models have been proposed to represent uncertainty in georeferenced specimen locations: possibility regions, qualitatively defined confidence values, error distances, and uncertainty fields. We analysed different methods: 1) for computing and recording coordinates for a locality; 2) for identifying the potential sources of uncertainty; 3) for determining the magnitudes of methods; 4) for combining uncertainties into a single estimate of maximum uncertainty associated with the coordinates in Italy. Starting from some data set, we evaluated difficulties and advantages of the different approaches and methods. Finally, we highlight the importance of sharing a common method of georeferencing to make aware the Italian scientific community about standards to adopt for naturalistic databases.
THE NETWORK OF DATABASES OF PHYTOSOCIOLOGICAL RELEVÉS OF ITALIAN VEGETATION: LISY DATABASE, STATE OF ART AND PERSPECTIVES.

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Project LISY (List of syntaxonomical units quoted for Italy) was supported by Società Italiana di Scienza della Vegetazione (formerly Società Italiana di Fitosociologia). It began in 1993 and it was aimed to the constitution of a database including all the phytosociological literature concerning the Italian vegetation; in the database all the quotations of syntaxa found in Italy have been recorded together with their geographical locations on the base of administrative and phytogeographical regions. A database was built including bibliographical and syntaxonomical data banks, the two data banks are parts of a relational database in which each syntaxonomical record is linked to its bibliographical source. This project has been active for more than fifteen years and indexed all the existing literature published up to 2004. Project LISY worked in 3 phases, the first (establishment of the database) was completed in 1996-1997, a first upgrade was done in 2001 and a second upgrade came to the end in 2007. At present the existing data banks include the entire bibliographical list covering years 1909-2004 (3307 bibliographical records and the syntaxonomical list with 32455 records). The data bank produced by this great common effort of Italian phytosociologists is now available in the web site of S.I.S.V. (http://www.scienzadellavegetazione.it/) and it is freely searched by researchers and technical staff of public administrations and protected areas. Now the upgrade of the existing database is planned to include literature data up to present time together with the exploitation of information potentiality of LISY database. Thanks to its information contents it will be possible to quantify the level of knowledge of the vegetation in the administrative and phytogeographical regions of Italy, evaluating the amount of vegetational data referring to the single regions. A second approach will concern the quality of vegetation information supporting the syntaxonomical quotations in the various regions of Italy concerning both the type of data and the date in which they were recorded.

BROMO MOESIACAE-STIPETUM EPILOSAE - A NEW ASSOCIATION FROM THE RELICT PETROPHYTIC STEPPE VEGETATION IN SOUTH-WESTERN BULGARIA

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It has not been up until the last decade of the 20th century when the principles of the Floristic School of vegetation classification started to gain wider application in Bulgaria. The result is that up to now only some geographic regions or vegetation types have been studied and classified according to the Braun-Blanguet approach, while others have been omitted or covered partially. Festuco-Brometea is among the vegetation types in Bulgaria which has not been fully described from a syntaxonomical point of view. This is why, in the recent years, there were several studies on dry grassland vegetation that led to the establishment of new associations and subassociations. The present study is one such case carried out on petrophytic steppes in the southern foothills of Vitosha Mt (SW Bulgaria). These steppes are part of the intrazonal vegetation distributed within the belts of xerophilous oak and mesophilous beech forests. They occupy mainly steep slopes of southern and south-western aspect. The bedrock is carbonate, soils are dry and shallow, and climate is moderate continental. A total of 38 relevés were collected and analysed using TWINSPAN in JUICE and cluster analysis in SYN-TAX. The analysis suggested the establishment of a new association Bromo moesiacae-Stipetum epilosae ass. nova. Apart from the calcicoles typical of Festuco-Brometea, the association is characterized by the presence of many regional and local endemics and species with Mediterranean and Ponto-continental distribution. This association belongs to the alliance Saturejon montanae. We assume that this vegetation is a part of the relict petrophytic steppes associated with an endemic centre of speciation in the low karst mountains of West Bulgaria and East Serbia. Two factors can be responsible for the diverse and rich flora of the dry grasslands in this region: 1) the spread of many thermophilous species of Mediterranean origin during the favourable climate changes of the Holocene, facilitated by the open structure of the calcareous grasslands; 2) the endemic speciation in the long-term stable intrazonal grasslands occurring in open patches within the zonal thermophilous forests.

CHARACTERISTICS OF THE *BIDENTETEA TIPARTITAE* R.TX., LOYMEYER ET PREISING IN R.TX. 1950 CLASS COMMUNITIES IN SELECTED COASTAL RIVER VALLEYS OF THE CENTRAL POMERANIA (POLAND)

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The habitats of riverside terophytes are protected as part of the European ecological Natura 2000 network (code 3270). These are communities of pioneer character, encountered in silty habitats where they develop as a result of natural processes of erosion and accumulation taking place in river valleys during prolonged periods of low water. This habitat type is naturally characterized by rapid changes. River regulation combined with straightening and deepening of the river channel leads to the elimination of riverside terophyte habitats. The field research was conducted in summer 2010. The investigated area encompassed the valleys of the Slupia, the Lupawa, and their tributaries in the Central Pomerania. Forty-three phytosociological records were made (according to the system of Braun-Blanquet) and presented in tables. The hierarchy classification with the MVSP package was used in order to arrange and group the collected phytosociological data and to single out the types of plant communities. Three plant communities belonging to one alliance Bidention tripartitae were identified: Bidenti-Polygonetum hydropiperis (Miljan 1933) Lohmeyer in R.Tx. 1950 nom invers., Bidentetum cernui Kobendza 1948, community with *Polygonum minus*. The diversification, structure, physiognomy and floristic richness of communities was examined. Detrended Correspondence Analysis (DCA) using the CANOCO 4.5 software package was applied to identify environmental gradients to define vegetation distribution. The study was supported in 2010-2013 by a grant from the Ministry of Science and Higher Education; grant No. N N305360439.

CHARACTERISTICS OF RIPARIAN TALL HERB FRINGE COMMUNITIES (CONVOLVULETALIA SEPIUM R. TX. 1950) IN CHOSEN COSTAL RIVER VALLEYS OF CENTRAL POMERANIA (N POLAND)

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Plant communities of the order Convolvuletalia sepium R.Tx. 1950 (Artemisietea class) are ecologically connected to the banks of brooks and rivers. They are a natural component of a typical riparian landscape and their habitats are protected as part of the European Natura 2000 network, being marked with the code 6430-3. The aim of the study was to investigate the diversity, structure, floristic composition and synanthropisation degree of Convolvuletalia sepium order communities occurring along the low parts of three costal rivers in northern Poland (Slupia, Lupawa, Leba). The study was based on 60 phytosociological Braun-Blanquet relevés obtained in 2010 from homogenous vegetation patches covering 8-20 m². The hierarchical classification with TWINSPAN software was used in order to systematize and arrange into groups the collected data. To explore variability of species distribution along environmental gradients DCA was performed using the CANOCO 4.5 for Windows software. The characteristics of differentiated associations was given, e.g., Soncho palustris-Archangelicetum litoralis R.Tx. 1937, Eupatorietum cannabini R.Tx. 1937, Urtico-Convolvuletum sepium Grs et Th. Mller 1969, Epilobio hirsuti-Convolvuletum sepium Hilbig, Heinrich et Niemann 1972. The study was supported in 2008-2011 by a Ministry of Science and Higher Education grant No. N N305231935.

CYTOLOGICAL INVESTIGATION OF SOME ARCTIC-ALPINE SPECIES FROM BULGARIA AND NORWAY

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Glacial relict plants that have survived as remnants of the flora of past geological ages on the Bulgarian territory in isolated habitats owing to a particularly favorable combination of microclimatic and soil conditions are object of a multi-disciplinary project named "Conservation of biodiversity in hot-spots of glacial relict plants in Bulgaria". During the complex investigation of some glacial relics with Arctic-Alpine distribution we focused also upon the cytological research of selected taxa. Plants were collected in their natural habitats in Bulgaria and Norway and then cultivated in pots in the greenhouse of IBER-BAS.

Chromosome numbers of 4 species of glacial relict plants from 14 populations originating from Bulgaria and Norway (*Antennaria dioica*, *Omalotheca supina*, *Dryas octopetala* and *Phleum alpinum*) are reported. Mitotic metaphase microphotographs are presented for all taxa studied. Three of the species did not show difference in their chromosome numbers between populations in both countries; however, *Phleum alpinum* showed different ploidy level of the Bulgarian and Norwegian accessions. For all species results are in agreement with previous reports. Brief comments on the ecology, general distribution, distribution in Bulgaria, population state are also given.

The results were obtained within the framework of the project BG 0034 financially supported by EEA Financial Mechanism 2004-2009.

USING GEOGRAPHICAL METHODS TO ASSESS THE CURRENT CONSERVATION STATUS OF COASTAL VEGETATION ALONG THE VALENCIAN COMMUNITY

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The Mediterranean vegetation from coastal cliffs dominated by endemic *Limonium* sp. is currently treated as a natural habitat of communitarian interest (annex I), and need the designation of special conservation areas for their proper conservation management (Directive Habitat 92/43). These plant communities are well characterized by the presence of the widespread Crithmum maritimum L., together to different species of Limonium, which revealed a remarkable ecological and biogeographical value. Ecologically, this type of vegetation grows on rocky soils, with a low plant density. Thus, these habitats are also considered as natural refugia of other narrow Mediterranean distributed species such as Helianthemum caput-felis included in annex II of Directive Habitat; Daucus carota L. subsp. hispanicus (Gouan) O.Bols & Vigo, D. carota L. subsp. commutatus (Paol.) O.Bols & Vigo, Diplotaxis ibicensis (Pau) Gmez-Campo and Medicago citrina (Font Quer) Greuter both included in the Spanish National Catalogue of Threaten Species-. These species are well adapted to the ecological conditions of coastal cliffs. All of them participate in plant communities located in upper coastal cliff areas directly influence by sea spray but not for continuous and direct sea water. The Valencian Community possesses a notably representation of this natural ecosystems along the coast (over 500 km), including mostly peninsular environments, although some island habitats should be strongly considered (e.g. Columbretes archipelago). This current communication is focused on these coastal ecosystems along the Valencian littoral. Each studied area has been geo-referenced, based on 1x1 km squares, using ArcView 3.3. The coastal cliffs have been classified in relation to their inclination: (i) less of 45; and (ii) equal or superior to 45. An estimation of real geographical surface against projected surface was calculated to get more suitable values about the total occupied geographical surface of these coastal habitats throughout the Valencian Community. Finally, a complete list of flora and a phytosociological revision of these plant communities are also presented since Crespo et al. (2003).

INFLUENCE OF RAINFALL PATTERNS AND SOIL SALINITY ON GRAZING RESPONSES IN MEDITERRANEAN PLANT COMMUNITIES.

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Coastal Mediterranean communities are submitted to several factors influencing the structure and the composition of plant communities: the variability of rainfall patterns, the land management by domestic grazing and the variation of soil salinity content. This work focuses on the interaction of these factors, and how they respectively control communities' structure and composition. We hypothesized that grazing represents the main filter influencing the xeric community' structure and composition compared to the variability of rainfall pattern, whereas soil salinity is hypothesized to be the major filter influencing the salt-marsh community.

An experimental design consisting of three grazing treatments (low instantaneous grazing pressure, high instantaneous grazing pressure and cessation of no domestic grazing), was set up in two Mediterranean communities differing in soil salinity content (xeric meadows, Mediterranean salt-marshes). An 8-year monitoring of vegetation allowed the analysis of the dynamics of each community by the Non-Metric Dimensional Scaling ordination (NMDS).

In xeric meadows, grazing appears the main driver of structure and composition through its control of the dominant species, except in the low instantaneous grazing pressure where rainfall patterns represent the main driver. In the Mediterranean salt-marshes, both grazing, soil salinity and rainfall patterns appear as the main drivers of structure and composition through their control of the dominant species.

Our hypothesis is verified in xeric meadows where we found grazing is the main filter acting on community structure and composition. However our hypothesis is not verified in Mediterranean salt-marshes: community structure and composition is driven by the interaction of the three factors. This assessment of the relative importance of rainfall patterns and soil salinity in controlling the structure and the composition of the Mediterranean communities, demonstrates the importance of taking them into account for assessing grazing management.

PLANT DIVERSITY OF VIHREN PEAK, PIRIN MTS (BULGARIA) WITH SPECIAL EMPHASIS ON GLACIAL RELICS

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Pirin Mts (SW Bulgaria) is the third highest mountain range in the Balkans and ranks among the richest in vascular plant diversity mountains in Bulgaria. The study area comprises the summit, Vihren peak (2914 m), and the adjacent areas above 2200-2250 m. More than 170 vascular plant and 120 bryophyte species have been recorded in the area. The analysis of the ecologic and biological structure of the vascular flora shows expected prevalence of herbaceous perennials and hemicryptophytes. A total of 30 species (ca. 10%) is present in the national Red Lists of vascular plants and bryophytes. Particular attention was paid to selected glacial relics and their communities in order to assess the state of and the threats to their populations. Among the target species were some arctic-alpine, boreal species and local endemics, such as: Antennaria dioica, Bartsia alpina, Bistorta vivipara, Dryas octopetala, Leontopodium alpinum, Papaver degenii, Phleum alpinum, Salix reticulata, Silene acaulis and Veronica kellereri. Most of these species have locally abundant but highly fragmented populations, restricted to small areas with harsh environmental conditions and absence of more competitive species. The studied vegetation is quite diverse. The communities on screes occupy largest territories and belong to the endemic alliance Veronico-Papaverion degenii. The communities of Saliceteta herbaceae are locally developed mostly on northern slopes and occupy limited areas, hosting fewer endemics than scree communities. The vegetation type of rock fissures (Asplenietea trichomanis) is characteristic for inaccessible sites and hosts many rare species. The main potential threat to the target species and their communities is climate change, especially warming and insufficient snow cover, since no more appropriate places at higher altitude are available. Tourist activities, rather intensive in the region, have relatively low impact with the exception of Leontopodium alpinum and the scree vegetation, that are sometimes subjected to gathering or trampling and erosion respectively.

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ALLIANCE ARRHENATHERION ELATIORIS IN WESTERN BULGARIA

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The mesic grasslands of the central part of Western Bulgaria referred to alliance *Arrhenatherion elatioris* Luquet 1926 is studied. There were made 298 relevés according to the methodological approach of Braun-Blanquet. Classification and ordination of the vegetation were performed. The analysis resulted in four associations - ass. *Ranunculo repentis-Alopecuretum pratensis* (Eggler 1933) Ellmauer in Mucina & al. 1993, ass. *Tanaceto vulgaris-Arrhenatheretum elatioris* Fischer ex Ellmauer in Mucina & al. 1993, ass. *Pastinaco sativae-Arrhenatheretum elatioris* Passarge 1964 and ass. *Ranunculo bulbosi-Arrhenatheretum elatioris* Ellmauer in Mucina & al. 1993. Within ass. *Ranunculo repentis-Alopecuretum pratensis* two distinct subgroups were observed, differing in soil moisture. The wet subgroup is the typical state of the association - var. typicum, but the drier subgroup is described as var. *Eryngium campestre*. The pasture/mowing management of the studied associations is presented graphically.

HABITATS RICH IN GLACIAL RELICT PLANTS IN BULGARIA

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The distribution of selected glacial relic plants within different vegetation types is studied. Analyses are based on original relevés, collected during 2009 and 2010 in Stara Planina, Rila and Pirin Mts. The target plant species are confined to snow-bed communities (*Salicetea herbaceae* Rila and Pirin), rock fissures (*Asplenietea trichomanes* Pirin and Stara Planina), scree vegetation (*Tlaspietea rotundifolii* Rila and Pirin), siliceous alpine grasslands (*Juncetea trifidi* Stara Planina) and alpine calcareous grasslands (*Elyno-Seslerietea* Pirin and Stara Planina). The syntaxa are linked to the corresponding habitat types. GIS maps for habitat and glacial relict species distribution are elaborated. The conservation significance of the habitats following Habitat Directive (92/43 EC) is analyzed.

DISPERSION OF ALIEN PLANTS ACROSS GRASSLAND TYPES IN BULGARIA

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The negative effect of alien species on the local biodiversity and ecosystem functioning is well known. National inventory of alien species and assessment of the invisibility of different vegetation types is required for development and application of effective control measures. Current analysis is based on the data collected during a National grassland inventory. The list of alien plants is elaborated following the available relevant data for Europe. The distribution of the alien plants in Bulgaria is in agreement with the patterns observed in the other European countries, e.g. the number of these species significantly decreases with altitude. We have not recorded any alien species in the relevés of Poion alpinae, Trifolion medii and Arrhenatherion (distributed between 800-1600 m alt.). Most affected is the vegetation developed close to settlements where true ruderal spots as well as spots with overgrazing are present. Wide dispersion of alien species has been registered in *Festucion valesiacae*. In the current inventory in 51 locations one or more of the following species have been recorded: Conyza canadensis, Erigeron annuus, Lavandula angustifolia, Medicago sativa, Peganum harmala, Portulaca oleracea, Robinia pseudoacacia, Solidago canadensis, Sorghum halepense, Vinca minor, Xanthium italicum, Xanthium spinosum. In Chrysopogon gryllus dominated communities 24 locations have been registered that contain some of the listed plants: Conyza canadensis, Lavandula angustifolia, Medicago sativa, Portulaca oleracea, pseudoacacia, Vinca minor, Xanthium spinosum, Robinia Xanthium strumarium. In the communities dominated by Nardus stricta no alien plants have been recorded so far. We may conclude that xerophytic vegetation of Festuco-Brometea is more affected by alien plants, whereas mesophytic grasslands (Alopecurion, Nardion) are still very occasionally invaded.

DIVERSITY AND DISTRIBUTION OF ARCTIC-ALPINE SPECIES IN CENTRAL STARA PLANINA MT. (BULGARIA)

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Arctic-Alpine disjunction is a biogeographical phenomenon encountered in Europe and Asia. Today, Arctic-Alpine plants are distributed in the tundra region and in the mountains of Central and South Europe, including the highest Bulgarian mountains, one of which is Stara planina Mt. The aim of this study was to record the diversity and distribution, and assess the state of the populations and communities of the Arctic-Alpine species in two sites of Central Stara planina Mt. - the peaks of Vezhen (2198 m, siliceous bedrock) and Kozyata Stena (1670 m, calcareous bedrock), where a relatively high concentration of such species was established. The flora of both sites comprises more than 200 species altogether, of which 95 are bryophytes. Twelve species of flowering plants and 6 bryophytes have conservation value, being endemics and/or Red-listed taxa. In the selected areas some 15 Arctic-Alpine species have been recorded. Their distribution and abundance differs in the two studied areas mainly due to the different substrate and elevation. The populations of some species are relatively large and in stable conditions, e.g. of Juncus trifidus, Gnaphalium supinum and Antennaria dioica at Vezhen peak. However, most target species have small and strongly fragmented populations, situated in the highest parts of the northern slopes, where due to the harsh ecological conditions they avoid competition with other species. On calcareous bedrock 53% of the relevés contain more than one of the selected species, whereas on silicate 78% express this pattern. Arctic-Alpine species play a significant role as diagnostic species for the plant communities. Their presence is relatively high and ranges from 1 to 62% of the total cover of the herb layer within the sampled relevés. The studied communities belong mostly to Potentillo ternatae-Nardion and Seslerion comosae, and very locally to Elyno-Seslerietea.

The results were obtained in the framework of the project BG 0034: Conservation of biodiversity in hot-spots of glacial relict plants in Bulgaria, financially supported by EEA Financial Mechanism 2004-2009.

HARDWOOD FLOODPLAIN FOREST IN SLOVAKIA: REVISION AND NUMERICAL CLASSIFICATION

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Hardwood floodplain forests in Slovakia are classified within the class *Ouerco*-Fagetea, order Fagetalia, alliance Alnion incanae, suballiance Ulmenion. Suballiance *Ulmenion* in Slovakia traditionally consists of 7 associations: Arunco-Salicetum capreae Hadač et al. 1969, Filipendulo-Salicetum capreae Hadač et al. 1969, Querco pedunculiflorae-Populetum tremuli omk et Hberov 1979, Ficario-Ulmetum campestris Knapp ex Medwecka-Kornas 1952, Fraxino panonicae-Ulmetum So in Aszd 1936 corr. So 1963, Fraxino-Populetum Jurko 1958 and Ulmeto-Ouercetum Jurko 1958. Four main syntaxonomical studies come from years 1950 1970 and were published by several authors from different regions. Everyone from the authors described several new subassociations, which are distributed only in one of the studied lowlands. It resulted to unclear classification of hardwood forests in Slovakia with numerous weakly differed units, especially at the subassociation level. We used 404 relevés ordered within the suballiance Ulmenion in the CDF (http://ibot.sav.sk/cdf/). During analysing all dataset by SYN-TAX and CANOCO PCA analyse we found just three significantly repeating groups, which represent associations: Ficario-Ulmetum campestris, Querco pedunculiflorae-Populetum tremuli and Arunco-Salicetum capreae + Filipendulo-Salicetum capreae. We exclude these three significant groups from dataset and analysed the rest of data again, using the same procedure as before. Results of analyses show very chaotic distribution of originally delimited subassociations. We selected dendrogram made by method beta-flexible, beta=-0,25 and coefficient Ruzicka. The dendrogram shows four clear clusters. According to this analysis the synoptic table has been created using percentage frequency and fidelity. We got four groups of relevés and compared them with the literature. They represents subassociations Fraxino pannonicae-Ulmetum caricetosum acutiformis So in Aszd 1936 corr. So 1964, Fraxino pannonicae-Ulmetum populetosum Jurko 1958 (Datko 1972), Fraxino pannonicae-Ulmetum carpinetosum (Simon 1957) Datko 1972 and Fraxino pannonicae-Ulmetum convallarietosum Jurko 1958.

PLANT DIVERSITY DYNAMICS IN SCOTCH PINE AND NORWAY SPRUCE PLANTATIONS IN THE MOSCOW REGION

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The replacement of natural forests with tree plantations is observed throughout the world. Its supposed that plantation can't maintain such floristic diversity as natural forests. However, in Russia there are not enough investigations on biodiversity in artificially established forests. This study was carried out in the conifer-deciduous forest subzone in south-western part of the Moscow region. Generally, native species (*Picea abies* and *Pinus sylvestris*) are used for afforestation. At the present time the area of planted forests is more than 290000 ha and accounts for 17% of the total region forest area. Forest inventory data and high resolution satellite imagery were used for identification of forest plantation sites. Field surveys were conducted in1996-2010 on 100 m² plots. In total, 158 plots including 75 plots in Scots pine plantations and 83 plots in Norway spruce plantations were sampled. Also oldarowth natural forests, which were assigned to ass. Rhodobryo-Piceetum Korot. 1986 according to the Braun-Blanquet approach, were assessed for comparative purposes. The stands at different development stages were analyzed. Dynamics of structure and floristic attributes of the pine and spruce plantations during rotation as well as trend of habitat factors using Ellenberg indicator values were assessed. The DCA ordination revealed distinct floristic differences between pine and spruce plantations that can be mainly related to the proportion of nemoral and nitrophilous species. In pine plantations better recovery of typical coniferous-broad-leaved forest tree species (with the exception of aspen) than in spruce plantations is observed. However, species composition of herb and moss layers in pine plantations is rather different from semi-natural forests. Forest plantations in the Moscow region arent usually monocultures, floristic similarity between plantations and natural forests increases with time up to 70-75% at the old-growth stage.

DYNAMICS OF VEGETATION OF SOUTHERN VOLGA-AKHTUBA FLOODPLAIN

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Five stationary transects crossing the whole floodplain were laid by research workers of Moscow State University under the direction of Tsatsenkin (1962) in 1954-1955 in Volga-Akhtuba flood-plain. The lines of transects were marked on aerial photographs showing the location of key plots of relevés. The transects of the northern parts of the floodplain were investigated again in 2008-2009 (Starichkova et al., 2009; Barmin et al., 2010; Iolin et al., 2011). One of the transects in the southern part of the floodplain was investigated in 2010 as well. Besides the years of 1955 and 2010 the transect in the southern part of the floodplain was state the results of the research of this transect.

The length of the transect is 18.0 km. In 1954, from September, 8 till September, 12 there were made 73 relevés of natural plant communities. By 2010 the part of the floodplain crossed by the transect (4.4 km) was diked to be protected against floods during high waters. On the diked area agricultural crops are grown. That is why the number of relevés of natural plant communities in 2010 is less than in 1955, namely 53. Relevés of 2010 were made from August, 8 till August, 16.

In 2010, in comparison with observations of the previous years there was a slight decrease in ccurrence of taxa that indicated high pasture load (*Amaranthus albus, Crypsis aculeate, Plantago major, Taraxacum officinale* group, *Salsola kali* ssp. *tragus*) as well as a slight increase of species that indicated xerophytization vegetation (*Bromus tectorum, Eremopyrum triticeum, Artemisia austriaca*).

The estimation of the preserved natural habitats was carried out according to Ramenskiy indicator values. Indicator values for humidity, active soil richness and salinity and pasture digression were used. In comparison with 1954 by the criterion of Kruskal-Wallis test, statistically significant difference in the environment habitats in 2010 was not found. The small number of the compared relevés can be the cause of this result.

FRAXINUS EXCELSIOR-DOMINATED FOREST PLANT COMMUNITY IN THE SE-PART OF THE TRANSYLVANIAN PLAIN (POLYGONATO LATIFOLIO-FRAXINETUM EXCELSIORIS)

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The European ash (Fraxinus excelsior) is a main component of the deciduous mesic woodlands of Europe (Querco-Fagetea), a rapid growth taxon which prefer basic soils on calcareous substrate. In the Carpathian basin and the surrounding area, the European ash was described in various coenotic structures (Alnion incanae, Carpinion, Tilio-Acerion) of several associations: Mercuriali-Tilietum, Aegopodio-Alnetum, Aceri platanoidis-Fraxinetum, Scolopendrio-Fraxinetum, Querco-Carpinetum s.l. etc. About the vegetation ecology of European ash distributed in the area of subcontinental mixed oak woodlands (Quercetea pubescenti-petraeae) we have less information. During the last few years we studied ash-dominated native stands distributed in the phytogeographical conditions of SE-Transylvanian Plain (Romania). The ash forests occurring slopes, walleys, sites near-steep slopes, N, NW, NEexposition, over clay, marle, marlstone substrates, on base-rich soils. After the coenotic structure of 35 stands of Fraxinus excelsior, can be concluded that they belongs to the Aceri tatarico-Quercion alliance. We described them as a new plant community named Polygonato latifolio-Fraxinetum excelsioris Kovacs 2010, which develop on peculiar site condition, bordering the mixed oak and oak-hornbeam woodlands. The tree layer is dominated by Fraxinus excelsior followed by Quercus robur, Acer tataricum, Acer campestre, Ulmus minor, Quercus petraea. In the shrub layer are frequent: Acer tataricum, Ligustrum vulgare, Staphyllea pinnata. The herb layer maintenance the most important diagnostic species: Iris graminea, Polygonatum latifolium, Aconitum anthora, Fritillaria orientalis, Veratrum nigrum, Pulmonaria mollis, Doronicum hungaricum, Tanacetum corymbosum, Aconitum moldavicum, Helleborus purpurascens. The peculiar stands have a good regeneration and, they probably are relic for the Transylvanian Plain. However, the spreading of ash in mixed oak forests area appears as a natural process. By the species composition and habitat characteristics, the Polygonato latifolio-Fraxinetum excelsioris forest plant community has a transitional position between Aceri tatarico-Quercion and Fagetalia syntaxa.

IMPORTANCE OF THE LOCAL VEGETATION RESEARCHES IN HEAVILY DEGRADED LANDSCAPES: A CASE STUDY FROM HUNGARY

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The natural vegetation of the Great Hungarian Plain have been totally perished or significantly damaged. The vegetation history is poorly known. Hence, there is a great importance to study the vegetation of the verges and another relict habitats. The aim of this project was investigating of the semi-natural habitats near Kisujszallas which is located on the middle-eastern part of the Great Hungarian Plain. 22 areas were distinguished with different size and vegetation.

Land-use history analysis were also made based on old military survey maps and ancient notebooks. Several types of data were documented, systematized, evaluated about the recent vegetation and compared to each other. Both GIS database and also vegetation map were made and also phytoconological relevés were taken up according to the Braun-Blanquet method in 25 m². A regiospecific naturalness evaluating system was developed due to the Hungarian General National Habitat Classification System (A-NER) could not be use for classify the habitats at this scale and specificity.

The preliminary results show that the recent habitats are mainly man-made. Momentous disturbance got through on the vegetation from the second half of the 18th century. The Nagyerdo is the most expanded, valuable and unfragmented one. The four major grasslands have a higher value than the forest itself. It is a wood-plantation. The Csivag-er is a small sized seasonal wetland. All of them are heavily degraded, often featureless and significantly different from the similar habitats in another areas of the Great Hungarian Plain. Several occurrence of protected and regionally rare species can be found there which have an enhanced importance as possible indicators of the former states.

The main role of this habitat-fragments are providing necessary ecologicalcorridors or stepping-stones for many species populations in the surrounding agricultural landscape. Our future interest are oriented toward the vegetation of the former river beds are in this agroecological area.

CHANGES OF SPECIES DIVERSITY IN BEECH FORESTS ALONG AN ALTITUDINAL GRADIENT – STUDY FROM VOLCANIC MOUNTAINS IN THE WESTERN CARPATHIANS

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Diversity pattern of herb (E1), shrub (E2) and tree (E3) layers of the beech forests along an altitudinal gradient was studied within South-Central Slovak volcanic mountains. The study relied on vegetation-environmental data matrix derived from the set of 168 phytosociological relevés with strong dominance of Fagus sylvatica in the tree layer (cover at least 50%). The studied mountain ranges are similar concerning relief forms, comparable volcanic bedrock, soils nutrient status and soil reaction. However, there are apparent differences within altitude and the associated climatic factors. Altitude of relevés ranged from 307 to 1190 m a.s.l.. No differences among mountain ranges were found in Ellenberg indicator values (EIV) for soil reaction and nutrients. On the contrary, statistically significant differences in altitude and EIV for moisture, temperature and light were found (ANOVA, p < 0.05). Our hypothesis was that the course of diversity along an altitudinal (climatic) gradient is unimodal with a minimum at more or less medium elevations and increasing diversity towards the margins, whereby the same applies to the other environmental variables. Typical beech forests could be enriched by species typical for communities marginal from the point of view of beech, consequently, species diversity of beech forests at margins of the altitudinal gradient should increase. Diversity patterns proved to be inversely unimodal, therefore, they were fitted to quadratic regression models. The minima of regression curves were found at the following altitudes (n species richness and s Shannon-Wiener diversity index): nE1 576 m, sE1 625 m, nE2 621 m, sE2 609 m, nE3 672 m, sE3 651 m (in all cases, p < 0.01 and R2 ranged between 0.0726 and 0.2488 with the highest values for sE3). A similar pattern was detected when latitude and xericity were considered as additional predictors. Minimum diversity was found at a similar altitude for herb and shrub lavers, but for tree laver, minimum diversity is shifted to higher altitudes. Our study was supported by grants of Slovak grant agency VEGA (2/0059/11, 2/0034/10, 2/0068/10).

TOWARDS AN ITALIAN SANDY COASTAL VEGETATION DATABASE

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The second national report sent to the European Commission about the implementation of Habitat Directive in Italy indicates that among all 130 habitats of the Annex I which are present in Italy, coastal dunes are among the few typologies that partially fall within the category "unfavourable conservation state". Their poor conservation state makes these Habitats with the highest risk level and which is most in need of attention and actions in the near future. In fact, even though Italian coasts present a huge diversity of psammophilous Habitats and species, the increase of the human activities and coastal erosion are serious threats, in particular for embryonic shifting dunes (2110), shifting dunes along the shoreline with Ammophila arenaria (2120), coastal dunes with Juniperus spp. (2250) and Cisto-Lavanduletalia dune sclerophyllous scrubs (2260). In order to bring the increasing loss of biodiversity afflicting Italian sandy shores to a halt, studies aimed to improving our knowledge of the species and habitats are urgently needed. In Italy there is a long tradition on vegetation surveys but the information is often scattered and scarcely available on line. On these bases, this work aims to develop an Italian database of coastal dune based on phytosociological relevés, with the scope of analyze variability, spatial distribution and conservation state of different sandy coastal Habitats. Till now about 2300 relevés were registered using the software Turboveg. Here we present the results from 1076 relevés concerning only peninsular Italy including 7 Habitats from fore dunes to back dunes. Preliminary results show that relevés are well distributed along the coasts, with a fair proportion of samples in each Habitat type and Region. Species diversity tends to increase from fore dunes to fixed dunes. Moreover, there is a differentiation of relevés according to the biogeographical region and this trend is more evident in the back dunes respect to fore dunes Habitats. The information derived from this national database could be also a powerful tool for the management of the Nature 2000 Network sites, offering guidance for habitat and species conservation.

THE RELATIONSHIP BETWEEN THE ABOVE-GROUND BIOMASS AND THE COVER OF HERBACEOUS VEGETATION

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Herbaceous biomass is often used as an important explanatory variable in various ecological studies focused on patterns in plant communities. However, the harvesting method is time demanding and not always applicable due to its destructive nature. Therefore, it has been sometimes replaced by rapid, nondestructive indirect estimation of plant cover or models based mainly on plant cover and stand height. However, several previous studies indicate that these variables are not directly interchangeable, sometimes they are wrongly used and the relationship between these variables is still not fully examined. We studied the relationship between the above-ground herb-layer biomass and percentage cover in European deciduous forests and non-forest herbaceous vegetation. The forest herb-layer often consists of plants of similar height and it varies from rather sparse to dense plant stands within more productive forests. We revealed strong positive correlation between forest herb-layer biomass and percentage cover within the range of cover values up to approximately 80%. Above this value the plants tended to form structured stands of several layers and the total biomass was more dependent on the stand height. The relationship between cover and the above-ground biomass within non-forest vegetation was much less predictable as the stands started to form complex multi-layer structure at much lower cover values.

THE IMPORTANCE OF SPREADING IN RARE SPECIES PRESERVATION: THE CEROPLASTIC

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The Mediterranean basin, with its more than 13,000 endemic species, is an important hot spot of the biodiversity of vegetables. In preserving this natural patrimony the divulgation and the information devoted to all kind of users, particularly all ranks of school, have a fundamental importance. The Botanical Museum of the Dipartimento di Scienze Botaniche of University of Cagliari promotes this aim by realizing a didactic way devoted to endemic species, particularly to dying species of European flora luckily preserved ex situ at the Botanical Garden. The Ceroplastic art keeps a very important place in such purpose. The species representative of critic situation or rarity in natural habitat are reproduced as wax models and then exhibited at the Botanical Museum. Every model is made by copying a real specimen, cultivated at the Botanical Garden. For example: Sardinian orchis, Argania sideroxylon Roem. et Schult., Crocus cambessedesii J. Gay, Euphorbia canariensis L., Astragalus maritimus Moris, etc. The technique used allows us to make very true representations and to fix, indelible in time, the phenological phases of the considered species. Beside, to the model is attached an explanatory card describing its morphology, the distribution area and the uses of the specimen in the original country. The representation accuracy of taxonomical features offers to the visitors the possibility to know and identify species without going to their natural areas of distribution and avoiding possible injures to very delicate ecosystems as consequence of careless visits. It also offers them the possibility to observe, at one cognitive moment, the different vegetative phases. The Botanical Museum of University of Cagliari proposes once more the noble art of Ceroplastic, which since XVII century has been strongly attached to the scientific spreading. Today it may contribute to citizen awareness for the most current environmental subjects as biodiversity preservation.

HOW CAN THE EXISTING DATABASES BE USED FOR EU HABITAT MAPPING? LITHUANIAN EXAMPLE

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Ground-based habitat inventory, which involves their distribution survey and data collecting on habitat structure and status, usually requires much time and human resources. These resources can be used more effectively by employing existing data and databases for vegetation structure analysis on habitat level. Several geographical databases that are related with spatial distribution of land cover units and vegetation mapping have been created and are developed in Lithuania. They were created by the analysis of satellite images and orthophoto or input of field research data. The main evaluation criteria of database survey were: i) precision of spatial data; ii) unit classification system and its relation to EU habitat types; iii) territorial coverage; iv) general scope/characteristics of mapping data; v) data relevance; vi) attribute data structure and scope; vii) compatibility with existing GIS technologies. The databases were classified into three categories according to their availability for inventory of each habitat type: i) initial the data can be used at initial stages, usually for selection of field research sites; ii) auxiliary the data can be used for extraction of some EU habitat types characteristics; iii) substitute the data include spatial distribution of EU habitats and can be used instead of field research. Results show that the most applicable information for habitat mapping can be found in databases employing classification units based on biological criteria or including field inventory data (Woodland Key Habitat Inventory, Lithuanian Grassland Inventory, Forest Cadastre Data). Databases storing geomorphology data (Water Bodies State Cadastre; Mire and Peatland Digital Map) can be used for habitat search. Recently created local EU habitat type maps (Natura 2000 sites) are still relevant, but their coverage is rather small comparing with the national scale. However, CORINE Land Cover Database, which has national coverage, was rejected as totally unsuitable for habitat inventory purposes.

THE COMBINED EFFECT OF WATERLOGGING, EXTRACTABLE P AND SOIL PH ON $\alpha\text{-}Diversity\text{:}$ A case study on mesotrophic grasslands in the UK

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Developing a strategy for evidence-based conservation is often problematic where a given habitat is found on relatively few small sites. Here, we investigate the important environmental variables that control species α -diversity in wet mesotrophic grasslands in lowland England. We analysed data on species richness and three soil variables from 10 mesotrophic grasslands to test the following hypothesis: is species diversity related to these soil factors, and if so, which is the most important?

Generalised linear modelling was used to derive minimum adequate models of these relationships. The analysis identified degree of waterlogging and its interaction with both soil available phosphorus and soil pH as significant. Species diversity decreased with increasing waterlogging and available phosphorus. If species richness is to be conserved in these mesotrophic grasslands, it would be best done by maintaining low levels of waterlogging (01 m weeks), and low available phosphorus concentrations(<10 μ g P g⁻¹). However, this approach may predicate against specialist wetland species. Our results will help develop sound conservation strategies for these mesotrophic grasslands, and points the way for further investigative research.

THE FORMAL CLASSIFICATION OF HIGH-ALTITUDE ARCTIC-ALPINE VEGETATION OF THE CLASS CARICI RUPESTRIS-KOBRESIETEA OHBA 1974 IN THE WESTERN CARPATHIANS

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Recently, alongside the vegetation surveys of Slovakia, the preparation of an expert system for the identification of individual vegetation units in Slovakia has started, using external a priori defined criteria created by the Cocktail method. The specific species-rich high-altitude vegetation of the class Carici rupestris-Kobresietea bellardii Ohba 1974 (CK), with the occurrence of many arctic-alpine and endemic species, was chosen for a case study. The analyses were based on a data set of 37204 phytosociological relevés from the Slovak Vegetation Database. The traditional classification of the class CK, based on cluster analyses, was reproduced satisfactorily by means of formalised classification, based on the formal definitions created by the Cocktail method together with the frequency-positive fidelity index affiliation. Unequivocal assignment criteria for all eight associations of both alliances [Oxytropido-Elynion Br.-Bl. (1948) 1949 and Festucion versicoloris Krajina 1933] of the class CK were formulated. The formal delimitations followed the traditional ones very well. It was demonstrated that the results of applying the formal definitions created on the basis of a large, geographically stratified data set capturing the occurrence of all vegetation types in Slovakia were highly similar in comparison with the traditional classification based on the results of cluster analysis. Keywords: alpine communities, Cocktail method, formalised classification, frequency-positive fidelity index, syntaxonomy, Western Carpathians.

ZONAL SUBALPINE PINUS MUGO SHRUBS IN EUROPEAN MOUNTAINS

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For zonal *Pinus mugo* shrubs of the European mountains, a great number of different and more or less incompatible classification approaches can be found. Our numerical analyses of more than 2 200 phytosociological relevés have generally confirmed the geographical and ecological differentiation of individual syntaxa, dominated by *Pinus mugo* s. str.

The results correspond with the classical conception of the three main groups of dwarf pine shrubs: 1) acidophilous and basiphilous communities of the *Pinion mugo* Pawłowski in Pawłowski et al. 1928 (the Carpathians, the Rilo-Rhodopean Massifs and species poor communities on siliceous bedrock in the Eastern Alps); b) basiphilous stands of the *Erico-Pinion mugo* Leibundgut 1948 nom. inv. propos. (the Eastern and South-Eastern Alps, the Dinarides); and c) the *Epipactido atropurpureae-Pinion mugo* Stanisci 1997 (the Apennines).

Each of these groups can be further divided according to altitudinal, edaphic, moisture or geographic gradients. We distinguished four general ecological types: I) a dry, rocky type on basiphilous bedrock; II) a moist type on nutrient-rich soils on basiphilous, as well as silicate bedrock; III) an acidophilous, oligotropic, species-poor type; IV) an oligotropic, windswept type at the transition between the subalpine and alpine belt on silicate bedrock. Based on the occurrence of individual floristic elements, geographical variability was classified either at the association or subassociation level. In the European area, 17 associations are distinguished. The nomenclature of all syntaxa have been discussed and revised.

Taking into account the obtained knowledge, the limited vertical distribution (the subalpine belt) of studied phytocoenoses, similar physiognomy, and mutual close syngenetic relationships between individual dwarf pine associations, we confirm their current classification within one order *Junipero-Pinetalia mugo* Boşcaiu 1971 and one class *Roso pendulinae-Pinetea mugo* Theurillat in Theurillat et al. 1995.

PLANT COMMUNITIES DOMINATED BY *PINUS BRUTIA* IN TERMS OF ECOSYSTEM SERVICES IN THE TURKEY

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Total forest area of Turkey is 21,8 million hectare, which consists of 26% of land area of the country. The largest forest area of this species is in Turkey, with more than 3,1 million hectares which comprises about 37% of the total land of coniferous forests in Turkey, distributed Mediterranean, Aegean and Marmara Region. Pinus brutia Ten. is named as a kizilcam in Turkish corresponding to the word redpine in English which is because of its reddish young sprouts and one of the important natural tree species of the Mediterranean region. Vegetation units are important for baseline inventory of landscapes. In the light of ecosystem services they become a planning unit. vegetation classifying into distinguishable units Thus, based on phytosociological analysis is a primary task for vegetation ecologists. Furthermore, vegetation units serve as data in ecosystem modelling approaches. Those units can carry information concerning different targets. For example, for conservation targets vegetation units can be ordered or ranked by the number of endemic species. The species richness of vegetation units is another possibility of ranking veg. units. Species rich ecosystems were found to be more stable. Hence, different aspects can be prioritized here. Conservation of endemics, of high species diversity and targeting at low species diversity ecosystems for possible improvements. This study deal with to determine vegetation units according to species richness of the dominated Pinus brutia forests. 450 relevés of Pinus brutia dominated vegetation unit were involved from publish and unpublished data. The relevés were georeferenced and analyzed using modern methods of multivariate statistics, including direct and indirect ordinations.

HABITATS OF THE PANNONICUM: INVITATION FOR THE PREPARATION OF A BOOK

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The book of the Hungarian Habitats published in 1997 and reworked in 2003 was again reworked after finishing the MTA habitat mapping program. This new version is now in print (in Hungarian). In this book 126 (semi-)natural, degraded and man-made habitats are described (definition, site conditions, physiognomy, typical species composition, subtypes, naturalness categories, regeneration potential). The habitat types are not identical with the Natura 2000 habitat types. Since most of the typical habitats of the Pannonicum can be found within the territory of Hungary, there is a possibility to rework this book into an English language book titled: Habitats of Pannonicum. So in the following years we plan to complete this book with habitat descriptions from other countries of the Pannonicum (Slovakia, Serbia, Romania, Czech Republik, Croatia, Austria, Ukraine, and also Bulgaria). Of course, first the boundary of the Pannonicum should be delineated. The completion includes: 1, completion of the description of the text with the specialities of the habitat types in each country 2. completion of the distribution maps (in a 5.5*6.5 km grid, subquadrats of the Central European Flora Mapping) 3. other minor changes We would like to invite our colleagues and friends to join the group of authors!

CHANGES OF GROUND VEGETATION FOLLOWING SHELTER WOOD CUTTINGS IN HEMIBOREAL PINE FORESTS

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Nowadays is important to reduce impact or forest management. One measure is replacing clear cutting to by shelter wood cuttings. The aim of this study was to evaluate the changes of ground vegetation, undergrowth, herbs and moss after shelter wood cuttings in hemiboreal pine forests. Investigations were conducted in mature stands after shelter wood cuttings of different time in Eastern part of Lithuania. We recorded projection cover of herbs and mosses in percent in 100 m² (10x10m) plots and amount of saplings in transect of 20 m length and 1 m width. It was determined that average number of species did not change in the shelter wood cutting of different age. The highest number of pine seedlings was recorded in the second year after cutting and number of seedling decreased in older shelter wood cuttings. The overall average projection cover of herb layer increased after shelter wood cuttings. Average projection cover of *Vaccinium vitis-idaea* decreased, while average projection cover of *Vaccinium myrtillus* and *Calamagrostis arundinacea* increased. Average projection cover of mosses decreased after shelter wood cuttings.

THE ECONOMIC ESTIMATION OF FOREST BIODIVERSITY FOR MOSCOW REGION

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The estimation of forest cover as the basin of accumulated carbon is urgent due to the existing problem of the global warming caused by the increase in the anthropogenic emissions of greenhouse gases in different sectors of economy (IPCC, 2003). The project is dedicated to the development of the estimation methods of the objective indicators which characterize the potential possibility of the afforestations to stock carbon, as well as to determine the economic estimation of the state and dynamics of forest cover in the process of its anthropogenic use. The calculation of the deposited carbon volume was fulfilled by estimation of the indicators of percentage of forest land and the kind of trees groups of forest cover. The Moscow region (45 800 km²) was taken as a model territory and for the detailed analysis we chose the southwestern part of Moscow area (4 800 km²). 3 statistic patterns were compared. The estimation of the current state of forestation was determined by using remote sensing data with average and high resolution images. As the result - 38% forestation for Moscow region has been defined. For the evaluation of the forest coverage in the period of most active forest usage (middle 18th century) the archive materials of the general land surveys (1768) were analyzed. This analysis demonstrated the average index of forestation about 35%. The model which describes the test territory with the forestation about 95%, was accepted as the initial forest cover state for studied region. Our research aims to quantify the carbon stocks and the stock changes in Moscow region forests by using different types of forest categories, not only forest and non-forest ones. The typological composition was evaluated with the usage of ecological-dynamic classification, which includes climax and secondary forests and by dividing them into the conifers, solid and soft-leaf. The vegetation map of Moscow region (1996) was taken as the basis. The project resulted in the estimation of the carbon stock storage based on the Total economic value conception (Barbier et al., 1997; Economic Values of Protected Areas, 1998), comparing 2000 and present situation.

POPULATION STRUCTURE OF WOODY PLANTS IN THE WADI ALJUFAIR OF THE CENTRAL REGION, SAUDI ARABIA

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The present study analyses the structure of populations of 18 common trees and shrubs in the Wadi Aljufair of the central region of Saudi Arabia through demographic survey of the plants. This study diagnoses the current situation of populations which are continuously subjected to cutting, overgrazing and other constraints. Such information is urgently needed as a basis for management plans ensuring their conservation and sustainable use. A tree and shrubs size class frequency distribution was applied to analyze the dynamics of the wadi, using census data from selected 18 plots (10 x 10 m) in the wadi, terrace, slope and wadi bed habitats.

The size frequency distribution of ruderal shrub species e.g. *Calotropis procera* and *Artemisia monosperma* had inverse J-shaped distributions which may represent rapidly growing populations with high reproductive capacity. On the other hand, the native populations e.g. *Acacia* spp have a tendency towards the J-shaped distribution. Such distributions characterize the declining population of limited regenerations capacity. However, most of the examined populations except those of ruderal species seem to be under environmental stress.

THE BETULA AETNENSIS RAF. WOODLANDS ON MT. ETNA (SOUTHERN ITALY)

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The study is concerned with the woody vegetation of an Etnean endemic species: Betula aetnensis Raf. The most relevant birch woodlands on Mt. Etna are located on the eastern slope in an altitudinal range between 1450 and 2000 m a.s.l. Some data about these woodlands were presented in our previous papers. The aim of the study was to highlight these woodlands, analyzing the flora, the plant communities and their synecological role. The study was carried out following the phytosociological method; the data were processed applying multivariate statistical methods. The study allowed to distinguish different vegetation types; they belong to the Querco- Fagetea Br.-Bl. et VI.VI. 1937 class. Some communities are to include to the Quercetalia pubescenti-petraeae Klika 1933 order. Lower syntaxa haven't been identified because of the particular floristic characteristics of the communities. The various communities are often characterized by the presence of species belonging to the herbaceous vegetation (Rumici-Astragalion siculi Poli 1965) of the higher altitudinal belt. The vegetation types are distributed along an altitudinal gradient: at the lower levels the birch woodlands are characterized by the presence of deciduous oaks (Quercus congesta Presl, Q. cerris L.). Up to 1750-1800 m a.s.l. there are birch woodlands with Pinus laricio Poiret or with Fagus sylvatica L. Where there are more edaphic moisture there is Populus tremula L.; on some sites the undergrowth is characterized by the endemic species Adenocarpus bivonii Presl. Some species of the near open areas, as Calamagrostis epigejos Roth, Pteridium aguilinum Kuhn, Juniperus hemisphaerica Presl, are often present. Up to 1750 m a.s.l. birch becomes gradually the only tree species. It often reachs the upper limit of trees (2100 m a.s.l.). Here the herbaceous layer of the birch vegetation is dominated by elements coming from the vegetation of the higher belt. The flora of the undergrowth is quite poor and decreases with the altitude. The dominant life form is represented by hemicryptophytes (49%), followed by phanerophytes (16%). The prevailing chorotype is represented by the endemics s.l. (39%); the Etnean endemic species are only 12%. They belong mostly to the herbaceous vegetation. The results obtained provide useful knowledge to understand community dynamics and to develop sound management programs.

The study was carried out within the Research project: "The Forests of Mt. Etna" funded by the "Dipartimento Regionale Azienda Foreste demaniali – Regione Sicilia"

BOTANICAL INVESTIGATION AND GRASSLAND MANAGEMENT ON THE HUNGARIAN GREY CATTKLE PASTERS

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Sample areas can be found in the Tapolcai Basins. Phytosociological samples were collected: 32 ha grassland stand with low intensity grazing (under-grazed pasture), 38 ha overgrazed pasture, 34 ha meadow (hayfield) and the stand where animals drinking. The areas were suitable for following up the changes of vegetation and production in every grazing season of a year. 5 pieces of 2×2 m phytosociological samples were examined on each sample area, prepared according to the Braun-Blanquet method (1964) in April, May, June, August and September 2008. There are 118 Hungarian Grey Cattle on the pastures.

In case of the Taplocai Basin, low number of species (20 to 30) was detected in the undergrazed pasture and the control area. About one month per year grazing time in the undergrazed area was not enough to achieve a better state for species diversity, and the amount of forage remained high. The overgrazed pasture carries a low forage value and contains a high number of weed species, despite the spectacularly high total number of plant species (38 to 39), consequently, grazing pressure has to be decreased. Although the number of species is lower in the hayfield (26 to 27), species composition and ability for forage supply is much better, showing that the proper management of the area is taken here.

CHARACTERIZATION OF TRASIMENO AQUATIC VEGETATION

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Trasimeno Lake is the fourth largest Italian lake, with an area of 122 Km². It's a natural lake with a maximum laminar depth less than 6 m, a low water renewal and hypertrophical conditions. ARPA Umbria, according to the Water Framework Directive 2000/60/CE, started surveying in 2010 meeting the objectives of establishing the ecological status of Trasimeno Lake using the aquatic vegetation. In according to survey protocol APAT 2007, macrophyte surveys were undertaken in three sites identified depending on vegetation distribution and lake geolithological influences. Only hydrophytes surveys carried out along transects at different depth levels.

Since indexes for the purpose of Mediterranean "polimittici" lakes assessing ecological status were not developed, environmental assessment is based on hydrophytes frequency and species diversity.

Submerged hydrophytes were found are not including exotic species, typical of high alkalinity environment and medium to high trophic levels tolerant (*Potamogeton pectinatus* L., *Myriophyllum spicatum* L., *Potamogeton perfoliatus* L., *Potamogeton crispus* L. etc.).

Several Characeae species, forming extensive grasslands especially in sud area Lake with large beds, were found.

The collected data were compared with those collected over the years by various authors. The results show that some floats hydrophytes and rooted hydrophytes with floats leaves declined, probably due to the loss of coastal habitat, suitable species development.

Trasimeno macrophyte flora survey is important for the purpose of Trasimeno assessing ecological condition and to plan appropriate measures to ensure eutrophication control and to preserve lacustrians biological community.

SMALL-SCALE SAMPLING OF A SCANDINAVIAN MOUNTAIN TUNDRA VEGETATION BY GRID METHOD

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Arctic vegetation occupies 7% of the Earth's surface and contains different ecosystems dominated by e.g. lichens, green mosses and dwarf shrubs. These ecosystems are inherently fragile, due in part to the simplicity of their systems and to the fact that many of the organisms present are existing close to the limits of their survival. These characteristics suggest that the arctic species will reflect more sensitively and rapidly to the global climate change. The current consensus is that global warming will affect both the vegetation patterns and the dominance relations of plant systems leading to complex ecological interactions that need to be studied in detail. Changes in the distribution of species or communities can be more easily detected at ecotonal boundaries. It is likely that such effects are more intense in mountain systems under limiting conditions, as in many alpine areas of Norway, in which most of the orophilous species are considered to be at the limit of their survival. Thus, it has been noted that plants of sub-alpine and alpine areas seem to be especially sensitive to global warming.

The study site located at the Hardangervidda plateau, near Finse and well representing the mountain tundra ecosystems.

The main goals were to determine the plant communities and their structures by the point quadrat method. Functional groups were ranked by their relative abundance and the number of species was also determined. For appropriate number of data a spatial grid was used, that cover the whole examined area (ca. 5 ha). The presence and percentage cover of each species in a radius of 20cm around a vertical pin was recorded. Plant traits then were measured on each of the plant species. Aggregated community scale trait values were calculated by weighing the functional groups trait value by its percentage presence.

Altogether 85 plant species were found in the relevés out of which 50 belong to the vascular plants. The highest species richness was observed among the lichens, herbs and monocots. However, the order of the functional groups differed concerning the plant cover, where lichens followed by green mosses, shrubs and monocots.

DETECTING AND MONITORING THE ENVIRONMENTAL QUALITY ALONG SPATIO-TEMPORAL GRADIENTS THROUGH ECOINDICATORS AND SOIL PARAMETERS.

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The aim of this study is to detect changes of species and communities along a temporal and spatial gradient in a Natural Reserve near Monterotondo (Rome). The Reserve covers about 1000 hectares of forest, between Tiber's Valley and Lucretili Mountains. The dominant vegetation is a deciduous oak forest represented by *Quercus cerris* and *Quercus frainetto* with hygrophilous forest patches with Quercus robur along the ditches and Quercus ilex shrublands in harsh, sunny slopes. This area, that was protected since 1997, has been monitored by data comparison from 39 phytosociological relevés and 26 soil profiles, carried out in two series of sampling during 1998-99 and 2009-2010 years. Three kinds of bioindication models - Ellenberg Indicators, Hemeroby's Index and Grime Life Strategies -were chosen as the experimental method, for their sensitivity to describe temporal dynamics of species and communities and to estimate the effects of human disturbance on forest ecosystems. The soil analysis also provided data about key factors in discriminating the different coenoses identified by phytosociological method. Along the spatial gradient, communities were discriminated by the soil parameter AWC (available water capacity), soil moisture and nutrients indicators. These three factors resulted correlated through Rank correlation Spearman Test (Rho = 0.7, p < 0.05). Along the temporal gradient of 10 years, light and temperature indicator values showed an increase, mainly in the Quercus ilex communities, in relationship with changes recorded in the thermo-pluviometric regime.

NATIVE OR NON-NATIVE? THIS IS THE QUESTION. AN APPLICATION OF THE ALIEN DATABASE OF ITALY

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Biological invasions are the result of species migrations occurring when the barriers that commonly prevent the natural dispersal of the propagules are somehow exceeded. Biological invasions have always occurred as natural phenomena, because of geological, climatic and biological events.

In Central Europe the difference between early and recent introductions has been long debated and the results are widely shared. In the Mediterranean Basin, this issue has not been well defined; for some ancient introductions due to the long history of human influence, it is difficult to know when the species first occurred and the role of human activities in their occurrence. For this reasons, in some Floras, archaeophytes (i.e. alien species introduced before 1500 A.D.) are considered as native (e.g. Greuter et al. 1984–1989). However the distinction between archaeophytes and neophytes is taken into account especially in invasive species control and management, because of the relation of archaeophytes to traditionally managed sites, considered as crucial for Nature Conservation.

In our study we aim at reconsider the status of the doubtful taxa and the archaeophytes, resulting from the latest inventory of non-native species (Celesti-Grapow et al. 2009). The analysis will be conducted at two levels. The first one investigating the native range in respect to the Italian peninsula, also considering the existing literature on pollen records, and the second one on the functional traits traditionally linked to plant species dispersal ability.

Our results shown that some of the species commonly considered as archaeophytes in European flora, such as *Allium sativum* L. (Kroll 1999), *Cupressus sempervirens* L. (Bagnoli et al. 2009), *Erysimum cheiranthoides* L. (Meusel et al. 1965), can be regarded as native elements within the Mediterranean flora.
SOME RESULTS FROM A DATA-BASE OF PHYTOSOCIOLOGICAL RELEVÉS OF OAK FORESTS IN PENINSULAR ITALY

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From a data base of the Italian phytosociological relevés of the Italian vegetation under ongoing development, the sample plots of oak forests in the peninsular regions of Italy and neighboring islands have been extracted and their distribution has been examined. This archive is basically aimed to the parameterization of phytosociological units in order to verify their ecological and biogeographical robustness. At present the data base stores 70% of the existing sources in literature.

The selected material corresponds to the communities at the level of association ranked into the orders of *Querceta* specifically dominated by oaks, recorded in the territories south of the watershed of Northern Apennines (peninsular Italy): *Quercetalia ilicis*, *Quercetalia calliprini*, *Quercetalia pubescenti-petraeae*, *Quercetalia robori-petraeae*.

The dataset used in this study is based on the sample plots identified as representative for different associations, described up to now in the certified botanical literature.

The locations of the plots, when geographical coordinates are missing, as it usually is the case in literature of previous decades, follows the given toponyms.

The aim of this analysis is to investigate the patterns of geographical spread of these units in the study area. We test whether or not the records fulfil the requirements for inferential statistic analyses at the national level.

The spread of the sample plots in the study area is highly uneven and does not match at all the ranges of the species of *Quercus* in the peninsula.

Their geographical assessment is therefore still far from sufficient for the study of patterns of coenological diversity and parametrization of associations other than at an extremely small regional scale.

TERRICOLOUS LICHEN COMMUNITIES IN BOREAL FINLAND

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To study terricolous lichen vegetation 140 relevés of the size 50 cm x 50 cm were made in lichen dominated vegetation of Finland from the hemiboreal to the northern boreal zone, most of them in the southern part of the country. The lichen communities are described and the relations with habitat factors (pH-value, specific conductivity, loss on ignition, humus type, soil depth), surrounding vegetation and species richness visualized by multivariate analysis diagrams. The lichens are also classified by Barkmans growth forms and growth form spectra for the relevés evaluated. For 77 relevés biomass was calculated from 5 cm \times 15 cm samples, which were dried and weighed in the lab according to standard methods. The most common types of lichen vegetation in Finland are successional stages in lichen rich pine forests from the Lecideetum uliginosae, a pioneer community of crustose lichens on raw humus, to the biomass-rich but species poor Cladonia stellaris synusia in old pine forests and several communities, which are dominated by cup or horn-like Cladonia species, in the primary succession on rock outcrops (Pycnothelio-Cladonietum cervicornis and Cladonietum alpicolae), on anthropogenically disturbed or sites on loamy soil on road banks or in gravel pits (Cladonietum nemoxynae) and on decaying wood or peat (Cladonietum cenoteae). The lichen vegetation in the northern boreal zone is strongly influenced by reindeer grazing. This shows in a much reduced biomass, but high species and growth form richness in the plots, up to 27 lichen species in 0.25 m^2 were found. Species richness biomass relationship showed Grimes humped-backed curve, which is mainly the result of the successional stages with highest species richness in intermediate succession stages on forest floors and rock outcrops as well. Finally the occurrence of the character species is shown to estimate the distribution of the communities in the Holarctic boreal zone

CORK-OAK FOREST IN SARDINIA: DISTRIBUTION AND BIODIVERSITY

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The cork-oak forests (*Quercus suber* L.) are the wooded areas of greater economic importance in the Mediterranean basin for the production of cork. Its uses have remarkably modified the forest structure, generating various typologies of cork-oak forests and also contributing to their extension. Through the CORINE Biotopes mapping of the target habitats, the survey highlights the regional distribution of the cork-oak forests floristic component in Sardinia. The stated thematic maps have been obtained by elaborating the satellite images (Landsat 7 ETM) and the aerial orthophotos (TerraitalyTM IT2006). The Landsat images have been used to identify and classify unsupervised and supervised typologies. Floristic surveys and aerial photo interpretation have further helped to correct the map. As a result, eight types of cork-oak forests have been taken into account as follows:

- 1. *Q.suber*-type lacking groundcover, similar to wooded pastures with an uneven distribution of scattered trees which usually do not cover more than 30% of the surface.
- 2. *Q.suber*-type occasionally ploughed or affected by wood fires with different species of Cistus sp. groundcover which, in different ways, benefit from the pasture to the detriment of both herbaceous and woody species, preferred by livestock.
- 3. *Q.suber*-type with a considerable distribution of trees but almost lacking groundcover due to the excessive pasture of sheep and cattle.
- 4. *Q.suber* type with *Cytisus villosus* groundcover.
- 5. *Q.suber* –type rich in evergreen sclerophyllous groundcover or thermophilic deciduous trees (*Calycotome villosa*).
- 6. *Q.suber* –type with the presence of *Q.ilex*.
- 7. *Q.suber* –type together with deciduous oaks (*Quercus pubescens* s.l.).
- 8. *Q.suber* -type together with deciduous oaks (*Q.pubescens* s.l.) and holm oaks (*Quercus ilex*).

According to their size the habitat maps, by using the CORINE Biotopes, have been divided in three categories: Ha 103.597 Tyrrhenian cork-oak forest; Ha 117.957 Evergreen oak-matorral; Ha 112.667 Dehesa. Wooded areas with less than 20% presence of cork-oak trees have not been taken into account. Results obtained are functional to define the best strategies of recovery and management.

FORMALIZED PHYTOSOCIOLOGICAL CLASSIFICATION OF THE LAKE TRASIMENO VEGETATION: AN APPLICATION OF THE COCKTAIL METHOD

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Lake Trasimeno is a large (about 124 km²) shallow lake with significant fluctuations of water table, and a site of high conservation value (Site of Community Importance, Special Protection Area and Regional Park) in Central Italy. Data about macrophytic, wetland, wet meadow, scrub, forest and ruderal vegetation of this area were collected during the last three decades by the present authors and other researchers and recently stored in the Anarchive database system. Vegetation classification was performed on a data set of 966 relevés using the Cocktail method. This method, designed to simulate the Braun-Blanquet approach, is largely based on expert knowledge, reflecting the field experience of the authors and the classifications published in the literature. In some cases, cluster analysis was also used to reveal the differences between communities with several generalist species, in particular within the class Molinio-Arrhenatheretea. All analyses were performed in the program Juice 7.0. The formal definitions were created using logical operators (AND, OR and AND NOT), combining species cover values and species groups. Sociological species groups and diagnostic species of the associations were determined using the phi coefficient of association. This method allowed to produce formal definitions for 79 communities included in 30 different alliances and 15 classes. The present work represents the first application of the Cocktail method in the Mediterranean area and Southern Europe. The number and distribution of the relevés are not sufficient for creating formalized definitions valid for a wide geographical area, but the Cocktail classification is largely in accordance with the expert-based classifications reported in the literature. It allowed to characterize different associations also in disturbed and floristically impoverished vegetation.

BOREAL ELEMENTS IN THE FLORA AND VEGETATION OF THE SILA MT. (S ITALY)

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Mountain vegetation in Mediterranean region represents an interesting combination of Mediterranean, Sub-Mediterranean and Boreal (s.l.) elements often of difficult phytosociological interpretation. In the South Apennine, mountain vegetation, has been influenced by glaciations favoring migration of northern species southwards enriching the plant communities with boreal taxa. Some of this communities survived until now in areas with particular climatic, geological and hydrological features assuming relictual meaning. Calabrian mountains, to which Sila belongs, represents the southernmost part of Apennine chain. Sila massif is the northernmost part of "Calabrian arc" - a siliceous Ercinic complex including S Calabria and NE Sicily. Because of its geological and climatic characteristics the studied area hosts a flora relatively rich in glacial relict boreal species, often at southernmost limit of their distribution. The flora of Sila consists of about 1000 species; more than 400 genera and around 100 families. The group of species with "Northern" distribution is about 10% between them Viola palustris L., Schoenoplectus supinus Palla, Limosella aquatica L., etc. with disjuncted area of distribution and Bistorta officinalis Delarbre, Leontodon saxatilis Lam., Carex echinata Murray, Eleocharis acicularis (L.) Roem. & Schult., Epilobium palustre L., Pyrola minor L., etc. in the southernmost limits of their areale. These species are localized in beech forests, fresh grasslands and wetlands and characterize associations referred to syntaxa with mostly Nordic distribution such as Nardetalia Oberd. 1949, Caricetalia fuscae Koch 1926, Fagetalia sylvaticae Pawl. 1928, Molinio-Arrhenatheretea Tüxen 1937, Nanocyperetalia Klika 1935, etc. Some examples of this vegetation types are presented, analyzing their floristic composition, the role of boreal species, their ecology and conservation value.



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