



24TH INTERNATIONAL WORKSHOP OF
EUROPEAN VEGETATION SURVEY



BOOK OF ABSTRACTS

“Typology and process as two complementary facets of vegetation survey and mapping”

“Vegetation in coastal and inland dunes and cliffs”



4 – 8 MAY 2015

UNIVERSITY OF RENNES 1, FRANCE

BOOK OF ABSTRACTS

24th EVS Workshop

“Typology and process as two complementary facets of vegetation survey and mapping”

“Vegetation in coastal and inland dunes and cliffs”

Rennes, France

4 - 8 May 2015

EDITED BY

Anne Bonis, Jan-Bernard Bouzillé and Sébastien Rapinel

ABSTRACTS REVISED BY

Members of the EVS 2015 Scientific Committee

TECHNICAL EDITORS

Sébastien Rapinel and Valérie Briand

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Session I. Vegetation pattern and mapping (I)

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Monday 4th May

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10:00 – 10:15 / PRINCIPLES OF SMALL-SCALE VEGETATION MAPPING OF KAMCHATSKIY KRAI (NORTH OF THE RUSSIAN FAR EAST)

Valentina NESHATAEVA, Anton PESTEROV

Komarov Botanical Institute Russian Academy of Sciences, Professor Popov Str., 2, Saint-Petersburg, Russia

** e-mail: vneshataeva@yandex.ru*

The goal of the investigation is to create a small-scale vegetation map (1: 4,000,000) of Kamchatka Peninsula and the adjacent territories of Northern Koryakia showing the natural zonal vegetation. The map is one of the blocks of Circumboreal Vegetation Map. The general small-scale vegetation map should reflect the peculiarities of macro-structure of vegetation cover connected with the differentiation of the environmental factors. The map reflects natural vegetation without human-induced changes taking place during the last 300 years, beginning from the annexation of Kamchatskiy Krai to Russia in 1700. The map is a plant geographical model reflecting the natural patterns of the vegetation cover existing under the influence of the certain solar and climatic factors and transformed by the modern and Holocene volcanic activities. The following principles are used: Vegetation map reflects the potential natural vegetation; Zonal vegetation types are shown for the plains: the map reflects the peculiarities of the latitudinal differentiation of the vegetation cover; Altitudinal belts for the mountain regions are: conifer forests, stone-birch forests, subalpine dwarf-woodlands ("krummholtz"), and mountain tundra; The map indicates the longitudinal (provincial) features of the vegetation cover related to climate as it changes from the coasts to the central part of the region; Vegetation types of the altitudinal belts in the mountains are analogous to the vegetation types of the plains. Information used to develop the map: MODIS space image – to decode and determine 8 main units: dwarf-pine shrubs, dwarf-alder thickets, stone-birch forests, tundra vegetation, snow fields and glaciers; sparse dwarf-pine woodlands, larch forests, spruce forests; digitized topography map (1: 1,000,000); digitized Vegetation map of the USSR (1: 10,000,000) – to distinguish the main latitudinal vegetation zones and altitudinal vegetation belts; digitized Forest map of the USSR (1: 2,000,000) – to distinguish the main tree dominants. This information was combined with the original field data (including more than 3,000 relevés dimensioned to the coordinate grid) and the contours size, shape and contents were corrected. We used the method of combining multiple layers of GIS in the package ArcGIS 9.3 and the expert selection main contours of vegetation. In certain cases we used automatic decoding of the digitized relief map for the detecting the position of altitudinal belts as they differ in different parts of the region. In cases where the altitudinal belts overlap we used a category termed macro-combinations. The minimal contour size accepted depending on vegetation cover structure was about 0.4 cm².

10:15 – 10:30 / SALTMARSH VEGETATION TYPOLOGY AND MAPPING BY THE COMBINATION OF FIELD DATA WITH MULTISPECTRAL SATELLITE IMAGES. AN EXAMPLE IN THE FRENCH NATURAL RESERVE OF ARÈS AND LÈGE – CAP FERRET SALTMARSHES

Samantha YEO, Mathieu REVEILLAS, Elsa ALFONSI, Virgil FIEVET, Jérôme ALLOU, Julien STEINMETZ, Anne PARIS, Sylvain BRUN, Viginie LAFON, Aurélie DEHOUC, Marie-Lise BENOT, Didier ALARD

BIOGECO, Université Bordeaux, Allée Geoffroy Saint-Hilaire, Pessac, France

** e-mail: marie-lise.benot@u-bordeaux.fr*

Saltmarshes are complex ecotones forming an interface between aquatic and terrestrial habitats. These wetland ecosystems of high ecological value provide a wide range of ecosystem services. Fringing fresh and saltwater bodies, they are submitted to diverse gradients of natural and anthropic origin, and are subject of high conservation issues. In a context of global change, vegetation mapping appears as a useful tool to understand and preserve the dynamics of saltmarsh plant communities. As part of the management plan of the French National Natural Reserve (NNR) of Arès and Lège – Cap Ferret saltmarshes, a technique combining a spatially explicit in situ vegetation survey with multispectral satellite images was tested for vegetation mapping. Between June and September 2011, 676 vegetation records were carried out. They were positioned systematically every 50 m to cover the whole range of the NNR (2 km²). After removing records that were considered as floristically heterogeneous, the combination of correspondence and cluster analyses enabled to identify six groups of records representing characteristic plant communities. In parallel, several spectral bands retrieved from high resolution multispectral images (Pléiades Satellite 1B) acquired via the RTU program (CNES) in April, August and December 2013, were selected and combined with indices of vegetation and water presence (NDVI, NDWI). An interactive supervised classification using data from vegetation records was applied on this false composite image to create a map of the vegetation of the NNR. This final classified map had an overall accuracy of 63%, with varying success between the different groups of records. Although improvements remain necessary to increase the reliability and accuracy of the map, this study indicates that combining high resolution remotely sensed images with field observations can be used as a basis to aid in saltmarsh vegetation mapping with the objective of monitoring vegetation dynamics.

10:30 – 10:45 / COUPLING PHYSIOGNOMY AND ECOLOGICAL COMPARTMENTS TO MAP THE POTENTIAL DISTRIBUTION OF ALPINE HABITATS IN THE FRENCH ALPS

Vincent THIERION, Denis MARÉCHAL, Alexis MIKOLAJCZAK, Marc ISENMANN, Thomas SANZ, Sandra LUQUE

IRSTEA, 2 Rue de la Papeterie, 38402 Saint-Martin-d'Hères, France

** e-mail: vincent.thierion@irstea.fr*

Biodiversity conservation is one of the most important issues on the environmental policies agenda since 1990's. Hence, the stakeholders need reliable information about natural habitat. A national project, CarHAB, launched by the Ministry of Ecology, has been initiated in 2011 with the ambitious aim of mapping the terrestrial vegetation at a fine scale (1:25 000). The main hypothesis of this research is that a semi-natural habitat can be classically defined both by a vegetation physiognomy and ecological characteristics.

This present work is based on three main recent methodological developments:

- a multitemporal and multiresolution classification of vegetation physiognomies using object-based image analysis,
- a species distribution modeling approach (SDM) to map ecological compartments,
- a coupling framework to bring together these two datasets and achieve semi-natural habitat distribution

This innovative method is illustrated and applied to a case study in Belledonne massif (French Alps). Firstly, the remote sensing approach aims at integrating the structure of vegetation (using VHRS image) and its phenological cycle during the growing season through the analysis of a set of LANDSAT images. 12 vegetation physiognomies are then extracted following an expert-based classification scheme. In parallel with this, a method using graph theory enables delineating vegetation communities on their ecological affinities. Among these, 5 were selected from expert knowledge for their wide distribution on the field, their ecological dissimilarities and their botanical consistency. BIOMOD platform is used to handle the modeling of the different ecological compartments. Finally, expert-based knowledge and an object-based approach, well-known to ease data mining, are used to integrate physiognomies and ecological compartments. As result, a fuzzy map of 31 different vegetation habitats (phytosociologic nomenclature) is obtained. Results seem to be promising for habitat mapping at a fine scale in a complex mountainous environment. The efficiency of our method is currently based on an expert evaluation. Although species distribution models and physiognomic classification have been statistically validated, a further effort to assess habitat distribution must be designed. Finally, such coupling, based on species surveys and publicly accessible imagery, gives opportunities for applying it to other mountainous areas (i.e. Massif Central and Pyrenees).

10:45 – 11:00 / LANDSAT IMAGERY BASED ALGORITHM TO DISTINGUISH *ROBINIA PSEUDOACACIA* FROM OTHER BROADLEAF SPECIES IN THE CARPATHIAN BASIN

Márton TOLNAI

Szent István University, H2100, Páter Károly utca 1., Gödöllő, Hungary

** e-mail: martontolnai.geo@gmail.com*

Robinia pseudoacacia (black locust) covers the 24 percentage of Hungary's forest stands. As an invasive species, beside its economic significance, it is important to monitor its spatial spread. Multispectral satellite remote sensing is the most obvious method to evaluate such task. Landsat imagery is the most frequently used remotely sensed data in many fields related to the monitoring of the Earth's surface. As Landsat satellites gathering data since 1972, lots of valuable information has been stored and can be derived from imagery provided by the Landsat archive of the United States Geological Survey for a long time interval. Plants are distinguishable by their spectral properties. However, the spectral difference between certain broadleaf species is not as obvious as the difference between broadleaf and coniferous species. In favour of precise results that can be a basis of useful applications, species specific occurrence of phenological events can be examined during the growing season. The presented algorithm works with sensible phonological events at the spatiotemporal resolution of Landsat Imagery to distinguish black locust from other broadleaf species.

11:30 – 11:45 / QUANTIFYING VEGETATION AREAS ACCORDING TO URBAN GRADIENT: AN ANALYTIC FRAMEWORK FOR URBAN ECOLOGY STUDIES

Marie JAGAILLE, Véronique BEAUJOUAN, Hervé DANIEL, Guillaume PAIN, Joséphine PITHON

Agroscampus Ouest - Unité Paysage et Ecologie, 2 rue André Le Nôtre, Angers, France

** e-mail: marie.jagaille@agrocampus-ouest.fr*

In a context of growing urbanization, it appears that the conservation of natural/semi-natural urban greenspaces may help to limit the erosion of biodiversity and to maintain ecological functions that are beneficial to humans. Therefore, the urban complex has become a research topic in ecology, with the underlying objective of understanding links between the spatial structure of cities and the biological processes that occur within them. The urban gradient approach can improve our understanding of these relationships. Initially, the estimation of human influence was limited to descriptions of land use, along transects, using density calculations (of population, buildings or roads). More recently, new methods have been developed to better quantify urban gradient characteristics, taking into account matrix complexity, establishing new land use and land cover classifications more appropriate for urban ecology issues, or through the selection of relevant indicators (partly inspired by landscape ecology). The calculation of quantitative descriptors raises methodological challenges such as: availability, heterogeneity, quality and processing of data; choice of appropriate indicators and linking spatial scales. This communication proposes an approach for quantifying urban gradient characteristics via an analytical framework for urban areas, applied at different spatial scales (field, urban block, district, urban area). This method, supported by GIS and remote sensing, is meant to be integrative (multisource data from national databases, production of additional data from satellite imagery), accessible (technically and financially), and suitable for urban ecology questions (vegetation mapping, plant and animal distribution analysis, urban climatology, landscape planning). Three cities of western France are studied (La Roche-sur-Yon, Angers, Nantes), ranging from medium sized to large urban areas. The method provides ecologists with a description of the urban complex, allowing a better description of the context of study sites, descriptive indicators for improving sampling strategy and a series of explanatory variables to test the response of living organisms to urbanization. Finally, the objective will be to identify districts with high ecological potential.

11:45 – 12:00 / MAPPING RESTORATION IN MOUNTAIN MEADOWS: GREATER SHIFT IN DELIMITATIONS OR IN MAPPING UNITS

Melanie FORKER, Mike HÖLZEL

HTW Dresden, Pillnitzer Platz 2, Dresden, Germany

** e-mail: forker@htw-dresden.de*

For more than 10 years in-depth vegetation analysis is taking place in a Special Area of Conservation (SAC) in the Eastern Ore Mountains nearby Dresden in Saxony, Germany. At present, everywhere in Europe attempts are made to restore species-rich grasslands. The exchange of success or failure of certain measures is particularly important. The location of our project sites (about 160 ha) below an intensively farmed plateau is challenging the regeneration efforts: eutrophication and erosion of arable sites are a constraint for restoration of the formerly nutrient-poor meadows on the lower slope. Today, all remaining target-communities are covering significantly less area than the former intensive grasslands which still dominate large parts of the project sites. The contribution will compare a time-series of 40 relevés in the target-communities with the results of two vegetation maps, elaborated in 2007 and 2014. The mapping units were developed and applied during the first phase of the project. For the recent mapping, subunits with transitions to mountain meadows or fresh meadows, had to be included, to quantify the development stages. The development of the meadow communities is hence expressed not only in altered shares of area, but also in the newly introduced mapping units. How can these effects be disentangled? A floristic detection of changes in species composition, and analysis of data related to the meadow maintenance, provides the necessary basis for discussion.

12:00 – 12:15 / THE VEGETATION MAP OF THE PROJECTED NATURE RESERVE "NYAMBOYTINSKY" IN THE YAMALO-NENETSKIY AUTONOMOUS DISTRICT (RUSSIA) AS A KEY-AREA FOR THE CBVM PROJECT

Vasilii Yu. NESHATAEV, E.I. DROZDOVA, L.V. LEONOVA

Saint-Petersburg State Forest-Technical University, Institutskiy pereulok 5, 194021 Saint-Petersburg, Russia

** e-mail: vneshataeva@yandex.ru*

The study of vegetation was carried out in the summer of 2014 during the environmental survey of the uninhabited area of 5021 sq. km in Tazovskiy region. The main goal was to produce a key-area survey for compiling the North-West Siberian part of the Circumboreal Vegetation Map. Another goal of the study was to organize the natural reserve in the region where oil and gas extraction is carried out. The studied area is located in the forest-tundra (subarctic-boreal) zone and the Ob-Irtysh geobotanical province in the north of Western Siberia. Vegetation map was compiled using field data and cameral interpretation of satellite images in a graphics package AutoCad at scale of 1:200000. The vegetation was characterized on sample plots laid along the routes crossing the main landscapes. The vegetation cover of the reserve is a complex of tundra, wetlands, floodplain willow shrubs and woods, open larch woodlands and larch forests, sometimes alternating with the patches of secondary birch forests. The crown density of larch forests occurring on the watersheds was no higher than 40-50 % and the average height of trees was 10-12 m at the age of 120-140 years. In the ground layer *Betula nana*, *Ledum palustre*, *Vaccinium uliginosum*, *V.vitis-idaea*, *Empetrum nigrum*, *Cladonia* species dominated. Large areas were occupied by open larch forests with the crown density 10-30 %. On the watersheds and in the small river valleys tundra communities formed by *Betula nana*, *Ledum palustre*, *Vaccinium uliginosum*, *V.vitis-idaea*, *Empetrum nigrum*, *Arctous alpina* occurred. On the slopes of small rivers and streams valleys lichen-dwarf-shrub and lichen-dwarf-birch tundra communities dominated. On the bottoms of the valleys and on poorly drained depressions of watersheds Sphagnum-rich communities with *Betula nana* and *Ledum palustre* occurred. About 30 % of the key-area was occupied by floodplain of the great river Taz. Floodplain vegetation was represented by meadows (*Calamagrostis purpurea*), tall-sedge fens (*Carex acuta*, *C. aquatilis*), willow-shrubs (*Salix phylicifolia*, *S. lapponum*, *S. lanata*, *S. glauca*) and willow-woods (*Salix dasyclados*). In the floodplains herb-rich (*Comarum palustre*, *Menyanthes trifoliata*) and *Equisetum fluviatile* communities were often found. In shallow waters, numerous small lakes and streams, aquatic vegetation with *Arctophyla fulva* and some other species was common. A significant part of the watershed was covered by palsa-mires with hollows rich with Sphagnum, sedges.

Session II.Dune vegetation

Chairperson: **Dr Laura CASELLA**, Istituto Superiore per la Protezione e la Ricerca Ambientale, Italy.

Monday 4th May

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14:30 – 14:45 / SPATIAL VARIABILITY OF TRANSITION DUNE HABITATS AT EUROPEAN SCALE

Silvia DEL VECCHIO, I. PRISCO, J. JANSSEN, A. ACOSTA, G. BUFFA

Ca' Foscari University, Dorsoduro 3246, 30123 Venezia, Italy

* e-mail: silvia.delvecchio@unive.it

The Italian coast of the northern Adriatic Sea shows biogeographic peculiarities which make it strongly atypical in the Mediterranean context. Based on floristic studies, Marcello (1960) described a “Venetian biogeographic lacuna”, a gradual reduction of thermophilous species which starting from the Gargano area, culminated in the Venetian coast. This peculiarity, explained in relation with the local climate (subatlantic rather Mediterranean), was supposed to produce a lack of Mediterranean species, favouring, on the other hand, the presence of boreal/Atlantic taxa. The same phenomenon was sketched by Pignatti (1959) at the community level. He described the *Tortulo-Scabiosetum*, a community of the transition dunes, endemic to the area that resulted to be structurally close to the Atlantic *Tortulo-Phleetum*, with which it also shared some species. To explore plant communities composition in terms of the climatic affinity we compared and contrasted plant communities in the N-Adriatic coasts and in several N-European (France, Belgium, Netherlands, Germany, Denmark) and Mediterranean (France, Italy) coastal areas. An extensive review, covering geographic and climatic variability at the European scale, allowed the compilation of a database containing 921 georeferenced phytosociological relevés of transition dunes, by using the software package TURBOVEG. Annual mean temperature and precipitation values have been downloaded from Worldclime database, and have been overlaid to the georeferenced relevés in ArcGis 9.2. Multivariate analysis and Permanova test were used to analyze data. The cluster analysis clearly separated 2 groups. Although forming a distinct group, N-Adriatic relevés segregated with N-European ones, confirming their low affinity with the Mediterranean context. N-European and N-Adriatic relevés shared a dominance in chamaephytes and hemicryptophytes and the presence of mosses and lichens. Similarity in floristic composition was mainly due to *Phleum arenarium*, *Cerastium semidecandrum* and *Silene conica*. Examples of diagnostic species of the two groups were *Fumana procumbens* and *Scabiosa argentea* in N-Adriatic, and *Carex arenaria* and *Corynephorus canescens* in N-Europe. Climatically, N-Adriatic relevés were associated to higher values of temperature and precipitations. Our results confirmed the peculiarity of N-Adriatic vegetation in the Mediterranean context and provide useful data to improve the knowledge of transition dune habitat at European scale.

14:45 – 15:00 / CLASSIFICATION OF EUROPEAN COASTAL DUNE COMMUNITIES USING THE COCKTAIL METHOD

Corrado MARCENÒ, A.T.R. ACOSTA, R. GUARINO, M. HERRERA, M. ISERMANN, J.A.M. JANSSEN, B. JIMENEZ-ALFARO, I. KEIZER-SEDLAKOVA, J. LOIDI, J.H.J. SCHAMINÉE, R. TZONEV, M. CHYTRÝ

Department of Botany and Zoology, Masaryk University, Kotlářská 2, Brno, Czech Republic

* e-mail: marcenocorrado@libero.it

In the last two decades, several authors stressed the importance of achieving a more standardized and formalized vegetation classification for phytosociological units. Several new methods were proposed with the aim of creating an international classification protocol that would integrate different classification approaches adopted in European countries. At present, the Cocktail classification method (available in Juice) offers a good compromise between the traditional subjective classification methods and more objective numerical approaches. The Cocktail approach makes it possible to translate field experience of researchers into a formalized algorithm. This method is still in progress: recently new procedures were added to handle species-poor vegetation and to include functional species groups in addition to sociological species groups. Using recent advances in the Cocktail method, we formalized the phytosociological classification at the alliance level of the perennial herbaceous vegetation of coastal dunes in Europe, North Africa, the Near East and the Black Sea region, in total using a set of 37.910 relevés. Formal definitions were developed for 15 alliances, recognized within the classes *Ammophiletea*, *Helichryso-Crucianelletea maritimae* and *Koelerio-Coryneporetea*. The alliances were related to environmental and biogeographical drivers. Finally, a new phytosociological framework was proposed based on the analysis of similarities between the alliances with the support of ordination techniques.

15:00 – 15:15 / SUBCONTINENTAL PSAMMOPHILOUS GRASSLANDS ON INLAND SAND DUNES OF POSTGLACIAL EASTERN EUROPE

Dmytro IAKUSHENKO

University of Zielona Góra, Faculty of Biological Sciences, Z.Szafrana 1 Zielona Góra, Poland

** e-mail: d.iakushenko@wnb.uz.zgora.pl*

The postglacial plains of the Eastern Europe, close to the Pontic floristic region, seem to be a core area for subcontinental psammophilous plant communities of the alliance *Koelerion glaucae* Volk 1931, developed on stabilised inland sand dunes. The present study aims to reveal the diversity, syntaxonomy and biogeographical peculiarities of the *Koelerion glaucae* communities in Central-Eastern Europe (Ukraine, Poland, and Belarus). This area comprise great variety of climatic conditions and evince differences in the age and thickness of the sediments. The TurboVeg database with more than 450 phytosociological relevés (including 325 author's relevés) was created. The relevés were analyzed by numerical methods using JUICE 7.0 software. Differences in the geographical variation in species composition were discussed. Special emphasis was made to chorological distribution patterns within genera rich in characteristic species for the alliance (e.g., *Festuca*, *Dianthus*, *Silene*). Constant, diagnostic and dominant species (including lichens and mosses) of vegetation groups were determined statistically. A revised syntaxonomical scheme of the alliance up to association level was proposed.

15:15 – 15:30 / DUNE VEGETATION OF SOUTH ITALY

Dimitar UZUNOV, Carmen GANGALE

CHLORA sas, 33 spirito santo Str., San Fili (CS), Italy

* e-mail: uzunovd@gmail.com

The structure and floristic composition of plant communities in the dune cost of South Italy (Calabria and Basilicata) are described. The studied area hosts one of the largest coastal dune systems in South Italy, characterized by the grey, white and embryonal dune series and in a few places complex of paleo-dunes, that reach 800 m, from the coastline. The observed communities belong to *Ammophiletea* Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946, *Helichryso-Crucianelletea Maritimae*(Sissingh 1974) Géhu, Rivas-Martínez & Tüxen in Géhu 1975 em. Biondi & Géhu in Géhu & Biondi 1994, *Cakiletea Maritimae* Tüxen & Preising ex Br.-Bl. & Tüxen 1952. The study considers the published data and adds numerous relevés mainly collected during the Natura 2000 Management plan elaboration since 2004. A syntaxonomical scheme and a detailed vegetation map of some areas are presented. The coastal vegetation in the area is often strongly modified by human activities and plant associations are alternated mainly by communities or elements of *Tuberarietea Guttatae* (Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) Rivas Goday & Rivas-Martínez 1963 nom. mut. propos. Rivas-Martínez, Diaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002 and *Lygeo Sparti-Stipetea Tenacissimae* Rivas-Martínez 1978 nom. conserv. propos. Rivas-Martínez, Diaz, Fernández-González, Izco, Loidi, Lousa & Penas 2002. The main threats and pressures are critically analyzed and some consideration for the management are elaborated on the base of the N2K experiences. Approaches for integrated coastal management at large scale that involve both naturalistic and administrative efforts are discussed. A case studies for the application of the Low Co(a)st Habitat Restoration at Km0 is presented.

Session III. Classification and ecology of wetland vegetation

Chairperson: **Dr David Zeleny**, Masaryk University, Czech Republic.

Monday 4th May

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Flavia LANDUCCI, Kateřina ŠUMBEROVÁ, Lubomír TICHÝ, Milan CHYTRÝ, Liene AUNINA, Claudia BITA-NICOLAE, Aleksandr BOBROV, Lyubov BORSUKEVYCH, Andraž ČARNI, János CSIKY, Els DE BIE, Dmytro DUBYNA, Panayotis DIMOPOULOS, Tetiana DZIUBA, Úna FITZPATRICK, Xavier FONT CASTELL, Daniela GIGANTE, Valentin GOLUB, Stephan HENNEKENS, Richard HRIVNÁK, Lorenzo LASTRUCCI, Svitlana IEMELIANOVA, Ute JANDT, Florian JANSEN, Zygmunt KĄCKI, Konrád LÁJER, Dalytė MATULEVIČIUTĖ, Attila MESTERHÁZY, José Antonio MOLINA, Jaanus PAAL, Eva PAPASTERGIADOU, Alessandro PROPERZI, Vladimir RANĐELOVIĆ, Marcela ŘEZNÍČKOVÁ, John RODWELL, Joop SCHAMINÉE, Urban ŠILC, Zofija SINKEVICIENĖ, Aleksei SOROKIN, Zvezdana STANČIĆ, Jazep STEPANOVICH, Boris TETERYUK, Rossen TZONEV, Roberto VENANZONI, Lynda WEEKES, Wolfgang WILLNER, Igor ZELNIK

Masaryk University, Kotlářská 2, Brno, Czech republic

** e-mail: flavia.landucci@gmail.com*

WetVegEurope is a project started almost two years ago with the aim of reviewing the European classification of aquatic (Lemnetea and Potametea classes) and marsh vegetation (Phragmito-Magno-Caricetea class), increasing its consistency, unifying classification concepts and proposing a sharable formalized classification. The project collected more than 300 000 vegetation plots and involves 40 data contributors and experts from 26 countries. We present here the methodological approach used for the formalization of vegetation classification and the first results concerning the Phragmito-Magnocaricetea class and the Phragmitetalia order in particular. The data management and analysis were performed using the programs TURBOVEG and JUICE. We used an improved version of the Cocktail method that involves functional species groups. This method is able to produce logical formulas for an automatic assignment of vegetation plots to the associations independently of the geographic area they come from. We increased the consistency of the classification by reviewing the previous classifications and establishing clear classification criteria and rules for aquatic and wetland vegetation. After establishing the general classification criteria and creating the classification of Phragmitetalia we are now working on a formalized classification of the whole range of aquatic and marsh vegetation. The same method and a similar protocol could be also used to create a formalized classification of other species poor vegetation types not included in our project.

16:30 – 16:45 / LAKE AND GROUND-WATER LEVEL INDUCED ZONATION COMPLEXES OF PLANT COMMUNITIES OF LAKE SHORES

Dr. Siegmar THOMAS

Dresden University of Technology, Knollenweg 17, Radebeul, Germany

** e-mail: siegmar.thomas@mailbox.tu-dresden.de*

Lake and Ground Water level induced zonation complexes of plant communities of lake shores Müritz lake: belts of wetland to drier grassland on dunes. An example shows species-rich wetland areas at Müritz lake shore, the largest German inland lake, near to a lagoon. It was a nature reserve, and is now part of the larger National Park Müritz. Ecology, hydrology, pedology and management practices are described after investigation in 1977 (Thomas 1979) including covered ground area by plant species (after Braun-Blanquet) in table and diagram, with soil profiles and groundwater level. It is partially compared with a new research work (Kühner 2004). Growth and species combinations of aquatic and terrestrial plant communities vary depending on altitude and elevation/depression landforms (or sea/lake bottom ground). This is valid for submerged plant belts and wet to dry terrestrial plant community belts. The plant growth below the lake water level, the submerged flora belts depend mainly on water deepness above lake ground along the depressions and elevations of the lake bottom. Main basics for terrestrial plant belts are floods during springtime and increasingly deeper groundwater level. The terrestrial plant community belts follow the surface depressions and elevations (strata in the direction of slope curves, the orthogonal trajectories of contour lines). This kind of spatial ecological order may be resilient against – moderate – permanent change of lake water level (decrease or increase of water level artificially by water constructions or by climate change). The aquatic and terrestrial plant belts will then be moved, and redeveloped in deeper or higher positions parallel to the new shore line. These processes will need a certain time of decades if no other disturbing processes exist. Also the site conditions will be changed into new balance, like soil stratification into oxidation and reduction horizons. The areas harbor a large variety of wetland-specific plant species, on lower sites flooded in springtime, and also terrestrial species of the juniper heath (with bushes of *Juniperus communis*). Protection and sustainable management was done with Scandinavian Fjäll-cattle at pasture, since 1969, recently also with Gotland sheep and Shetland ponies introduced into the herd.

Session IV. Classification and ecology of mountain vegetation

Chairperson: **Dr Gilles Thébaud**, UNIVÉG, France.

Wednesday 6th May

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9:15 – 9:30 / VEGETATION OF INTERMOUNTAIN DEPRESSIONS OF CENTRAL CAUCASUS: OLD LAND-USE HERITAGE AND CONTEMPORARY CHANGES

Elena BELONOVSKAYA, Raisa GRACHEVA, Vera VINOGRADOVA, Alexander KRENKE

Institute of Geography RAS, Staromonetny per. 29, Moscow, Russia

* e-mail: belena53@mail.ru

The plant communities of forests, meadows, mountain steppes of intermountain depressions in the Central Caucasus has been transformed with different intensity during thousands of years by man for agrarian purpose. Cultivated lands began to form more than 3000 years ago. The man-made terraces on the slopes were adapted as arable lands for centuries, then transformed for pastures and hayfields for decades and ceased for use and weakened of grazing pressure during the last twenty years. With the help of the maps of vegetation indexes (NDVI), vegetation conditions indexes (VCI) and satellite climatic extremes indexes (SCEI) the changes of climatic parameters were shown. The humidity growing and therefore vegetation conditions' improvement in the middle and high mountains belts were revealed. The analysis of the field data of the key-areas in the absolute heights range of 1500-2200 m and remote sensing data (the summer Landsat images of 1989-1991 and 2011 years, the scale of 30 m) show the processes of altitudinal belts' borders changing and the natural vegetation recovering: descending of the pine forests' lower border and reforestation of the *Molinio-Arrhenatheretea* meadows on the southern slopes; expansion of *Betulo-Adenostyletea* forests on the northern slopes; renewal of the *Festuco-Brometea* mountain steppes on the southern slopes. Thus the vegetation of intermountain basins restores under unidirectional influence of climate and socio-economic changes. The *Festuco-Brometea* communities are met also on the deforested northern slopes. Such similarity of vegetation cover independently of location could be explained by the same type of the former land use. For ages the areas of both slopes were used primarily for plowing and later for grazing and haying. The cross-discipline studies including study of natural components and history of land-use management could find out and divide roles of climate changing and social-economic process in observed natural vegetation recovering. The relevant survey approaches could be used in other mountain regions with the similar land-use experience. Researches were supported by RFFI grant N° 14-05 00233A.

9:30 – 9:45 / CLIMATE CHANGE AFFECTS DIFFERENTLY SUBALPINE-ALPINE PLANT COMMUNITIES

Magali MATTEODO, Pascal VITTOZ, Eric VERRECCHIA

Université de Lausanne, Géopolis building - Unil Mouline, Lausanne, Switzerland

** e-mail: magali.matteodo@unil.ch*

Mountain regions are warming rapidly and the upward shift of plant species has been observed on many alpine and nival summits. On the other hand, the reaction of the subalpine and lower alpine plant communities to the current climate changes has been little investigated so far. Other factors are changing simultaneously at these elevations. Nitrogen deposition due to pollution increased remarkably and this could alter species composition by increasing productivity of the plant communities. But the increase of nutrient concentration in soil could result from the higher mineralization rate that is expected under warmer climate as well. Finally, the increasing temperatures, combined with lower precipitations, lead to an earlier snowmelt and therefore longer growing seasons. In this study 67 old, exhaustive plant inventories have been selected in the Swiss Alps and revisited after 25 to 50-years in order. The records cover a broad range of plant communities distributed along a subalpine–alpine elevation gradient. Both calcareous and siliceous grasslands have been studied, as well as snow bed and ridge communities. The studied grasslands were quite stable in terms of species composition, whatever the bedrock type, although some of the species increasing in frequency indicate a trend towards warmer conditions. By contrast, the snow bed communities showed pronounced vegetation changes and a clear shift of the communities towards dryer grasslands. The longer growing seasons, with shorter snow cover, allow alpine grassland species, taller and hence more competitive, to colonize snow beds. Similarly, communities below firn showed increasingly dry conditions because the water supply is shortened by the higher melting rate of the snow, what allows the colonisation by grassland species. None of the retained communities were colonised by plants indicating nutrient-rich soils. This study showed that subalpine-alpine plant communities reacted differently to the on-going global changes. Plant communities linked to long snow cover are the most vulnerable to climate change and their persistence in the near future is seriously threatened. Alpine grasslands are more stable and, up to now, none of these communities seem to be affected by increasing nitrogen concentration in soils.

9:45 – 10:00 / MEDITERRANEAN SILICICOLOUS ALPINE GRASSLANDS OF THE IBERIAN PENINSULA

Rosario G. GAVILÁN, Beatriz VILCHES, Borja JIMÉNEZ-ALFARO, Alba GUTIÉRREZ GIRÓN,
Xavier FONT & Miquel DE CÁCERES

Facultad de Farmacia, Universidad Complutense, Madrid, Spain

* e-mail: rgavilan@ucm.es

Mediterranean silicicolous alpine plant communities of the Iberian Peninsula appear on altitudes of more than 2000 m. From a floristic and phytosociological point of view these territories are well known. Our aims have been to know: How many plant communities exist in this vast territory? What are the floristic and ecological relationships between them and between those territories? What species characterize them? Have these communities any kind of relationship to plant communities of northern territories as the Cantabrian Range or the Pyrenees? Three big mountain ranges of Spain: Sierra Nevada, Sistema Central and Sistema Ibérico, conveniently enlarged to southern Cantabrian and Pyrenees ranges. We have compiled 1500 phytosociological relevés aprox. from these areas. We have classified with a non-hierarchical unsupervised method (Noise Clustering) to create ball-shaped clusters around each prototype vector leaving outliers and transitional relevés in the Noise cluster. We have then carried out different analytical approaches including fuzzy classifications and ordinations to interpret the results obtained. At the same time, we have also determined the indicator species that characterizes those plant communities and/or the local territories where they live (massifs). Also we have wanted to know species characteristics in common between those plant communities that could appear in different massifs. We have found southern-northern differences from the most Mediterranean range (Sierra Nevada) that is also the richest in endemics. However, the rest of mountain ranges also showed differences but maintaining some similarities among them, not only at a physiognomic level but also at association level. Individual massifs displayed characteristic species, including endemics of the area. Respect to substrata we have also found interesting results, in areas of Sistema Central and Sistema Ibérico with a similar physiognomic structures but resulting in different associations. A more or less large number of species characterizing a combination of site groups gives an idea of the relationships between different territories.

10:00 - 10:15 / A SURVEY OF THE ALPINE VEGETATION OF THE IRANIAN MOUNTAIN RANGES

Jalil NOROOZI, Wolfgang WILLNER

VINCA, Giessergasse 6/7, Vienna, Austria

* e-mail: noroozi.jalil@gmail.com

Our study focuses on the vegetation types of the alpine region of Iranian mountains. These habitats have been poorly investigated despite the large variety of narrowly distributed vascular plant species and the expected vulnerability of these ecosystems to global warming and overgrazing. In this study we wanted to know which plant communities occupy these ecosystems and what is their syntaxonomic position? Which environmental factors determine the species composition of these habitats? Almost 700 phytosociological relevés were collected in altitudes between 3000 and 4800 m a.s.l. from Alborz and Azerbaijan mountains in N and NW Iran. This data set was classified using TWINSpan, and the numerical classification was translated into a syntaxonomic system. Floristic differences between vegetation types were evaluated using detrended correspondence analysis (DCA). A total of 319 vascular plant species were recorded and four major vegetation types were recognized in this study: 1) Tall herbs and umbelliferous vegetation, which is mainly dominated by species belonging to the Apiaceae, occupy the subalpine zone. The *Cousinieta* *hypoleucae* order was described for this vegetation type, with one alliance and three associations. 2) Alpine snow-bed vegetation was accommodated in the the *Taraxaco brevirostris*-*Polygonetalia serpyllacei*, with one alliance and three associations. 3) Thorn-cushion grasslands, which usually cover the alpine xerophyte habitats, were classified as the *Drabetalia pulchellae*, with three alliances and 10 associations. 4) High-alpine and subnival scree communities were arranged in two orders (*Physoptychio gnaphalodis*-*Brometalia tomentose*, *Didymophysetalia aucheri*), three alliances and ten associations. The assignment of these orders to phytosociological classes is still provisional except for the scree communities for which a new class - the *Didymophyso aucheri*-*Dracocephaletea aucheri* was described. The Altitude, aspect, snow-melting time and soil are the major ecological drivers having impact on the species composition and formation of the vegetation mosaics. The study introduces a syntaxonomic classification of alpine vegetation types in Iranian mountains, thus providing a scheme for ongoing ecological surveys and monitoring programs to assess the impacts of climate warming and human land use on these unique ecosystems.

Session V. Vegetation pattern and mapping (II)

Chairperson: **Dr Doug Evans**, European Topic Centre on Biological Diversity, France.

Wednesday 6th May

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11:00 – 11:15 / LARGE-SCALE MAPPING MOUNTAIN STEPPE VEGETATION OF SOUTHERN SIBERIA USING TO SATELLITE IMAGES OF HIGH RESOLUTION

Mariya POLYAKOVA, Nikolay ERMAKOV

Central Siberian botanical garden, Zolotodolinskaya, 101, Novosibirsk, Russia

* e-mail: galatella@mail.ru

The mountain steppes large-scale mapping was performed using high-resolution images (World View - 2, 2m resolution) in key area located in the Minusinskaya Intermountain Basin (Southern Siberia). All diversity of steppes was included in two classes - *Festuco-Brometea* Br.-Bl. et Tx. ex Soo 1947 and *Cleistogenetea squarrosae* Mirkin *et al.* ex Korotkov 1991 representing two bioclimatic vegetation types in Southern Siberia and Mongolia and occurring in the same landscapes within the Minusinskaya intermountain basin. Dataset including 80 relevés of steppe communities was input in the TURBOVEG database (Hennekens 1996). The vegetation classification was produced using the Braun-Blanquet method and TWINSpan analysis realized in JUICE 7.0. The DCA ordination using DECORANA (Hill 1979). Analysis of multispectral satellite images was carried out with computationally efficient segmentation algorithms (Pestunov *et al.* 2011, 2012). The DCA ordination results demonstrated consolidation of all steppe relevés in two main groups corresponding the steppe classes. The analysis of ecological peculiarities of species composition in all communities made it possible to interpret the axis 1 as complex gradients of two factors – climate continentality and specific of bedrocks. The axis 2 was interpreted as a factor of soil humidity. Along the axis 1 all relevés were clearly subdivided into two classes corresponding to two main bioclimatic-geographical subdivisions of steppe vegetation: West Palaearctic steppes (*Festuco-Brometea*) and the East Siberian and Central Asian steppes (*Cleistogenetea squarrosae*). Vegetation types arranged along axis 1 form also a petrophytic set of communities according to bedrocks factor. Replacement of steppe communities within each classes according to humidity factor was observed along the axis 2. The basic ecological pattern of plant communities represented in diagram of DCA ordination was used as a basis for the vegetation map legend construction. The Legend consists of 2 hierarchical vegetation levels. The highest level includes the bioclimatic vegetation types and second level represents the ecological petrophytic series of plant communities related to substratum type. Petrophytic series are represented by ecological vegetation types according to humidity factor. The high-resolution images made it possible to establish a correct landscape position of steppe communities and their combinations depended on the specific ecological factors.

11:15 – 11:30 / ASSESSMENT OF THE SUFFICIENCY OF NATURA 2000 NETWORK FOR HABITAT PROTECTION IN ITALY: ART 17 VS 2014 DATABASE

P. ANGELINI ¹, L. CASELLA ¹, F. PANI ²

¹ ISPRA – Italian Institute for Environmental Protection and Research

² MATTM – Ministry of the Environment and Protection of Land and Sea of Italy

*e-mail: pierangela.angelini@isprambiente.it

Habitats Directive and consequently the Natura 2000 network is the main tool for habitat types conservation in Europe. In Italy the Directive was applied in 1997, therefore the process of implementation of the network in Italy was born in the very early phase of the Directive application. Since from the early stages application knowledge on habitat types distribution have greatly deepened and improved, a consequent series of inevitable repercussions affected the development of the network. The assessment of current contribution of Italian Natura 2000 network to habitat types protection has been carried out by analyzing and comparing the habitat types distribution data reported on 3rd National report under Habitats Directive Article 17 and in the Natura 2000 Italian national database. Differences in spatial resolution of the two dataset were overcome applying a normalization procedure. To evaluate objectively any possible shortcomings, a methodology of gap analysis has been used. Criteria to assess inconsistencies encompass the extent of hedging values and distribution sites. The results identify a priority subset habitat types with specific features requiring a further work in order to define the assessment. On these habitat types was performed the maximum entropy method (Maxent), a correlative niche modeling techniques well-suited for habitat types geographic distribution modeling with presence-only data. This allowed to define the most suitable areas for any of the habitat types considered. Comparing the model with the SCI distribution is possible to detect if there are areas and if so where, which require the establishment of additional SCI. Despite the implementation of Natura 2000 network has encountered problems over years, the process can now be considered sufficiently stable to achieve an efficient structure for habitat types conservation in Italy. A future challenge is to establish a wide shared pan European formal definition of all Annex I habitat types to produce sound distribution maps, relying on precise, unique and comprehensive classification.

11:30 – 11:45 / HABITAT MAPPING ON DIFFERENT SCALES USING NATURA 2000 AND THE NATIONAL (ÁNÉR) HABITAT CATEGORIES IN SOUTHEAST HUNGARY

Áron József DEÁK

University of Szeged, Department of Physical Geography and Geoinformatics, Körtöltés utca 1/F I/5, Szeged 6724, Hungary

** e-mail: aron@geo.u-szeged.hu*

Since 2002 several habitat maps were created in Southeast Hungary connected to different surveys (MÉTA-mapping, survey of certain Natura 2000 sites). All the actual mappings used Hungary's General National Habitat Classification System (ÁNÉR) which contains categories for all natural, semi-natural and non-natural habitats of the country. This system was revised three-times considering field experience. The country-level main habitat mapping of MÉTA (Landscape Ecological Vegetation Database & Map of Hungary) resulted a rasteric map with 35-ha sized hexagons. A hexagon contains a habitat checklist with an estimated extension of habitats using a percentage range scale. This map presents the distribution and ratio of habitats with the help of round diagrams. During the surveys of Natura 2000 sites both the ÁNÉR and the Natura 2000 habitat categories were used. The Natura 2000 categories usually fit well to the national categories. However the Natura 2000 category of Pannonic salt steppes and salt marshes don't describe the geomorphological and hydrological heterogeneity fine enough especially on finer scales, because 9 different habitats are included in this category covering a wide range of communities with very different ecological requirements from saline euhydrophyte communities to dry saline grasslands. Some natural habitats aren't represented in the Natura 2000 system (e.g. tall-sedge beds, reed and rush beds) so mapping the whole vegetation requires the use of a local system as well. These habitat categories treat the transitional (even multiple) habitats well so finer changes can be described during long-term biodiversity monitorings. An example is the annual (2010-2013) habitat mapping of transects alongside a humidity gradient and the monitoring of the regeneration of fallows in the Upper Kiskunságián Turján-land in Kunpeszér, where especially the wetter habitats showed quick and sensitive response to the changes of available water. Different transitional habitats appeared on many plots year by year in the natural grasslands and in the fallows as well and even habitat exchanges have happened. Polygonal maps on landscape- and country-level require comprehensive but descriptive categories with habitat-complexes like it happens in case of the renewal of the vegetation map of Hungary (Zólyomi's map). As a part of this work a landscape-level polygonal vegetation map was made with 10 categories for 1/3 of Southeast Hungary covering 10 geographical units.

11:45 – 12:00 / PERSPECTIVES IN COMMUNITY-LEVEL SPATIAL MODELLING FOR EUROPEAN VEGETATION DATA

Borja JIMÉNEZ-ALFARO, Milan CHYTRÝ

Masaryk University, Kotlarska 2, Brno, Czech Republic

** e-mail: borja@sci.muni.cz*

The historical knowledge on European vegetation is nowadays enriched by the information contained in large-scale plot databases. Using these data under spatial modelling approaches may provide new tools for understanding biogeographic patterns and also for generating products useful for habitat management and conservation at the continental scale. Spatial modelling at the community-level is essentially based on the combination of biological surveys on species co-occurrences and environmental data for generating spatial predictions on a region of interest. Different approaches have been used for different organisms mostly at regional or local scales, but very few examples exist for spatial modelling of vegetation plot data at large scales. Here, we demonstrate some of the main outputs that can be obtained from community-level spatial modelling when applied to European vegetation data. We show main statistical tools and possible applications derived from predictive mapping of (i) community types, (ii) axes of compositional variation, (iii) species richness and (iv) deconstruction of communities in species groups. These tools are expected to provide a complementary approach to other studies based on functional patterns (e.s. remote-sensing products) or individual species (e.s. species distribution modelling). We conclude that spatial modelling offers useful information on the spatial properties of plant communities to be incorporated in European vegetation surveys.

12:00 – 12:15 / GIS MODELING AND MAPPING OF NATURAL HABITATS FROM ANNEX I OF DIRECTIVE 92/43/EEC IN BULGARIA – METHODOLOGY AND APPLYING IN THE ESTABLISHMENT AND MANAGEMENT OF THE PROTECTED SITES FROM NATURA 2000 NETWORK

Rossen TZONEV, Ch. GUSSEV, M. DIMITROV, V. RUSAKOVA, K. LAZAROVA, D. DIMOVA, T. BELEV, S. MARIN

Department of ecology and environmental protection, Sofia University "St. Kliment Ohridski", 8 Dragan Tzankov Blvd., Sofia 1164, Bulgaria

** e-mail: rossentzonev@abv.bg*

A mapping of the distribution of habitats in Bulgaria on the bases of GIS models was done for the needs of project Preparation of the Bulgarian NATURA 2000 network of protected sites. The maps of 74 habitats from totally 90 from Annex I of Habitat Directive which occur in Bulgaria, were done on the basis of different initial data. Therefore, they also have different level of authenticity. Mainly, the information from Forestry projects has been used for 26 forest habitats. Nine coastal habitats have been mapped directly on the field; 30 freshwater habitats, grasslands, shrub and heathlands have been modeled on the base of different data – forestry projects, CORINE land cover maps, farming, geological and soil maps and existing map of the vegetation of Bulgaria (Bondev 1991). There are also some data for nine natural habitats with limited distribution from different project or their coverage was established on the basis of the best expert opinion. The results of this mapping and modeling have been used for the national evaluation of the habitats and their coverage within national NATURA 2000 network during the biogeographic seminars of the European Commission. They have been used also in the project Red Data Book of Bulgaria, Natural habitats. GIS models of habitat were the basis of the mapping of habitats and assessment of conservation status during the implementation of project "Mapping and Assessment of Conservation Status of Species and Habitats". These habitat models could be used as basis also for the mapping of Bulgarian vegetation.

Session VI.Describing habitats and underlying patterns

Chairperson: **Dr Ute Jandt**, Martin-Luther-University Halle-Wittenberg, Germany.

Wednesday 6th May

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Nicolay A. SOBOLEV, M.V. KAZAKOVA

Institute of Geography, Russian Academy of Sciences, Prishvine St. 19, Ap.23, Moscow, Russia

* e-mail: sobolev_nikolas@mail.ru

Resolution No 4 of the Standing Committee of the Bern Convention considers wooded steppe complexes (EUNIS code X18) as a habitat type of European importance to be protected in the Emerald Network. According to EUNIS, wooded steppe complexes consist of combinations of Perennial calcareous grassland and basic steppes (E1.2) and Thermophilous deciduous woodland (G1.7) habitat types. The interpretation manual of the Emerald habitats describes both mentioned habitat types basing on their flora and vegetation. In wooded steppes of European Russia Sarmatic steppes (E1.2D2) and Ponto-Sarmatic sand steppes (E1.2G) predominate being composed by various syntaxa of *Festuco-Brometea* Br.-Bl. et R. Tx. ex Soo 1947. Forest component includes White cinquefoil oak woods (G1.7A11) and Tartar maple steppe oak woods (G1.7A12) listed in EUNIS classification. The related vegetation belongs to *Querco-Fagetea* Br.-Bl. et Vlieger in Vlieger 1937. Besides this, Siberian steppe birch woods (G1.919) and similar birch dominated habitats often constitute the forest component of wooded steppe. The related vegetation belongs to *Brachypodio pinnati-Betuletea pendulae* Ermakov, Koroljuk et Latchinsky 1991. Shrub vegetation fringing forest plots belongs to *Rhamno-Prunetea* Rivas Goday et Borja Carbonell ex. Tx. 1962. Separate shrub thickets belong to *Amygdalion nanae* V. Golub in Iljina *et al.* 1991 (from *Festuco-Brometea*). In our opinion, both shrubby habitat types correspond to the description of Western Asian wild fruit tree steppe woods (G1.7C9) nevertheless the last ones have another expected geographic distribution. Regarding the high specificity of natural conditions in European Russia, we assess the compliance of studied natural sites to the requirements of Emerald Network by inhabiting of locally rare vulnerable species belonging to the plant communities, which constitute wooded steppe habitats. Usually such species are redlisted on the subnational level. Their presence proves the good state of considered habitats and improves a legal base for conservation. Vulnerable animal species inhabiting both steppe and forest habitats indicate the sufficient integrity of the wooded steppe complex. Russian experts have identified 126 Areas of Special Conservation Interest for wooded steppe protection in European Russia by 1 February 2015 under the Joint Programme between the European Union and the Council of Europe for the Preparation of the Emerald Network of Nature Protection Sites, Phase II.

16:15 – 16:30 / FINE-SCALE SPECIES RICHNESS ALONG SOIL PH AND PRECIPITATION GRADIENTS ACROSS EURASIAN TEMPERATE GRASSLANDS

Salza PALPURINA, Viktoria WAGNER, Milan CHYTRÝ, Henrik von WEHRDEN, Annika BRINKERT, Jiří DANIHELKA, Norbert HÖLZEL, Johannes KAMP, Pavel LUSTYK, Kristina MERUNKOVÁ, Zdenka PREISLEROVÁ, Karsten WESCHE, Michal HÁJEK, Petra HÁJKOVÁ, Michal HORSÁK, Martin KOČÍ, Svatava KUBEŠOVÁ, Mikhail CHEROSOV, Nikolai ERMAKOV, Dmitry GERMAN, Paraskovia GOGOLEVA, Nikolai LASHCHINSKY, Vassiliy MARTYNENKO

Masaryk University, Kotlarska 2, Brno, Czech Republic

** e-mail: salza.palpurina@gmail.com*

The relationship between soil pH and fine-scale species richness of vascular plants changes across climatic regions. In most European temperate grasslands, richness peaks at pH between 6 and 7. However, little is known about the richness-pH relationship in more arid parts of Eurasia. Study regions span a large precipitation gradient in Eurasia, from the Czech Republic to Mongolia and Yakutia. We asked: 1) whether richness-pH relationships vary across regions; and 2) which factors – soil pH or water availability (proxy: precipitation), is more important at the Eurasian scale. Data on soil pH and species richness of vascular plants were collected in 10×10 m plots; modelled mean annual precipitation (MAP) was obtained at the scale of ca. 1×1 km. Across Eurasia, fine-scale richness of dry grasslands and its variability increased strongly with precipitation; soil pH decreased and its variability increased with precipitation. Thus, dry grasslands in regions of high precipitation (> 600 mm) were locally both species-poor and species-rich (ranging from 30 to > 130 species/100 m²), and occurring on high-(7-8) to low-pH (4-6) soils. In such regions (Czech Republic and Slovakia, Bulgaria, the Southern Urals), linear regressions revealed unimodal richness-pH relationships, with a peak at pH of ca. 7. In regions with, on average, lower precipitation (< 450 mm) than the previously mentioned but of comparable soil pH range (5-7; Kazakhstan, Altai-Sayan), richness decreased with soil pH. In regions of very low precipitation (< 350 mm, Yakutia, < 250 mm, Mongolia), soils were mostly of high pH due to higher accumulation of cations; local species richness there was very low (on average, below 30), and did not show any relation to pH. In temperate grasslands across Eurasia, precipitation was stronger control of local richness than pH, with ca. 10 species per 100 m² added each 100 mm of precipitation.

16:30 – 16:45 / STATUS & TRENDS OF EUROPEAN UNION HABITATS

Douglas EVANS

European Topic Centre on Biological Diversity, 57 rue Cuvier, Paris, France

** e-mail: evans@mnhn.fr*

The European Environment Agency recently published “State of nature in the EU”, a report which includes assessments of the status of all birds and selected other species and habitats occurring in the European Union. The assessments are based on reports by the Member States for the periods 2008-2012 (birds) and 2007-2012 (other species and habitats). Assessments have been made for each biogeographical or marine region for each habitat listed on Annex I of the Habitats Directive with each assessment classed as Favourable, Unfavourable-inadequate, Unfavourable-bad or Unknown. For assessments which are unfavourable, the trend (improving, stable, deteriorating or unknown) was also evaluated. Overall only 16% assessments are considered Favourable with most being either unfavourable-inadequate (47 %) or unfavourable-bad (30 %). One third of the unfavourable assessments are stable with only four percent improving. For the terrestrial biogeographical regions, the Alpine, Macaronesian and Steppic regions have the largest proportion of habitat assessments as favourable. The Atlantic biogeographical region has the lowest proportion of favourable assessments (9 %) although it also has the highest proportion of unfavourable assessments which are improving (11 %). The Boreal region has the highest proportion of unfavourable assessments which are deteriorating (close to 50 %). There is also variation between habitat groups with dunes, grasslands and wetlands having >80% of assessments as unfavourable. The two most frequently reported pressures and threats for habitats (both mentioned in 19 % of Member State reports) are those associated with agriculture (including both intensification and abandonment) and modification of natural conditions of water bodies, mostly changes to hydrology. There is considerable variation between countries, with the proportion of assessments reported as favourable varying from four percent (The Netherlands) to 98% (Cyprus). The proportion of habitats reported as unfavourable-bad was highest (approximately 70 %) in Belgium, Denmark and the United Kingdom while Bulgaria reported no habitats as unfavourable-bad. Some of this variation is real, but an unknown proportion is due to differences in methods and there is a need for further improvement and harmonisation. The dataset, including spatial data, is downloadable from <http://www.eea.europa.eu/data-and-maps/data/article-17-database-habitats-directive-92-43-eec-1>

16:45 – 17:00 / FROM THE FACIES OF SERIES AND GEOSERIES OF VEGETATION TO THE HABITATS OF COMMUNITY INTEREST

Vincent BOULLET & Vincent GAUDILLAT

National Museum of Natural History - Service du patrimoine naturel, 36 rue Geoffroy Saint-Hilaire, CP 41, 75231 PARIS Cedex 05, France

* e-mail: gaudillat@mnhn.fr

Traditionally, to clarify the definition of the habitats of Community interest of the Annex I of the EU Habitats Directive, crosswalks were established with plant associations. In recent years, the implementation of the CarHAB project of vegetation mapping of mainland France according to landscape phytosociology led to a great increase of works on series and geoseries of vegetation and their facies (sigmafacies and geosigmafacies). Consequently it poses the question of the links that can be established between these landscape units and the habitats of Community interest. The methodological foundations of the CarHAB project are linked to the geobotanical, dynamic and catenal framework of the vegetation (GÉHU 1977; GÉHU & RIVAS-MARTÍNEZ, 1981; RIVAS-MARTÍNEZ, 1976 & 2005; LAZARE, 2009; CHALUMEAU & BIORET, 2013), which achieves a significant development in southwestern Europe. A remarkable originality of the project is to give a prevailing place to landscape facies, integrating partly the landscape phytosociological approach developed in Switzerland by THEURILLAT (1991, 1992). A key objective of the CarHab project is to contribute to the reporting under Article 17 of the Habitats Directive and crosswalks have to be established with the habitats of Community interest. As series and geoseries are composed of plant associations, the crosswalks can be made at this level. But another approach would be to connect directly the habitats with the series, the geoseries or their facies. This work presents different examples and shows, comparatively, the advantages and challenges of the second approach. For instance, some habitats, such as Humid dune slacks (2190), correspond to geoseries. Sometimes it is a complex of habitats that constitutes a series, i.e. habitats 3280 and 92A0 (vegetation of the alluvial banks of Mediterranean rivers). Other habitats correspond to parts of series or geoseries. So, the habitat 6210 (dry grasslands of the *Festuco-Brometea* and their scrubland facies) usually corresponds to the "grassland" and "recolonization complex" facies of *Quercus pubescens* series or dry beech-oak series... Applied to all habitats of Community interest, this crosswalk could highlight the habitats for which the CarHab mapping will provide direct, only partial, or even no information, and so for which habitats additional inventories should be considered.

17:00 – 17:15 / DESCRIBING VEGETATION AT THE LANDSCAPE LEVEL: “SYNPHYTO”, A DATABASE DESIGNED FOR SERIES AND GEOSERIES DATASET WITHIN THE VEGFRANCE PROJECT

Camille ROUX, Gilles THEBAUD, Jan-Bernard BOUZILLE, Anne BONIS, Stephan HENNEKENS

UNIVEGE Clermont-Université, 3 Bd Lafayette, Clermont-Ferrand, France

** e-mail: camille.roux@clermont-universite.fr*

The CarHAB project is designed to map vegetation all over the French territory, and is funded by the French ministry of environment. Both analytical relevés (plots), and geosynrelevés are realized within this CarHAB program. Synrelevés are relevés of syntaxa within the same vegetation succession in an homogeneous ecological spatial framework (series) and geosynrelevés are relevés of syntaxa along an ecological gradient in an homogeneous geomorphological spatial framework (geoseries) The UNIVEGE team in Clermont University was more particularly in charge of proposing both a typology and a methodology to map vegetation of French low mountain range at the landscape level, while including the vegetation dynamic dimension. Vegetation relevés realized at the landscape level present peculiarities that need to be taken into account in the data model for being stored in a database. Accordingly, we designed a specific module of the vegFrance data base for storing synrelevés and geosynrelevés data set, using the Turboveg framework. This proposition will be presented considering the vegetation in the close surrounding of Clermont-Ferrand, in the Chaîne des Puys, in the Massif central. The presentation will detail the structure of the database SYNPHYTO, the parameters planned to characterised the syn/geosynrelevés, the method to record them as well, the links with the GIS and the mapping of series and geoseries. We will also propose the method to analyse this type of relevés according to the principles of dynamic-catenal phytosociology.

17:15 – 17:30 / TOWARDS ENVIRONMENTAL DATA STANDARDS FOR RELEVES AND SYNTAX

John S. RODWELL

7 Derwent Road, Lancaster LA1 3ES, United Kingdom

* e-mail: johnrodwell@tiscali.co.uk

Over past decades, huge numbers of relevés have been collected across many European countries (Schaminée *et al.* 2009) and traditional methods of phytosociological recording have generally ensured high standards of point-source data on plant species assemblages. The development of widely used software such as TURBOVEG and JUICE has also encouraged comparability of analytical approaches and interpretation of distribution patterns and ecological processes among these data and the syntaxa defined from them. More recently, the establishment of the European Vegetation Archive (EVA) has coordinated the assembly and exchange of relevé data and the harmonisation of species names. Proposals for common standards in the recording of environmental data have also been made (Mucina *et al.* 2000) but there the situation is still not so simple or advantageous. Standards vary widely, in terms of the habitat parameters recorded in the field (if any are recorded at all) the nature of the secondary sources of environmental data used to interpret emergent patterns and processes and the environmental typologies and glossaries employed in the description of syntaxa and their interrelationships. And how such data are encoded is also very diverse. Meanwhile, other widely-used typologies of habitats such as CORINE and EUNIS have provided policy-related frameworks that make their own reference to environmental relationships using bespoke parameter frames and glossaries. Recent funded research on the revision of the EUNIS Habitat Classification for the European Environment Agency (Schaminée *et al.* 2013, 2014) and the DG (Environment) Red List of European Habitats project (Rodwell *et al.* 2013) provide a new opportunity and impetus in the quest for some commonality in the provision and categorisation of environmental data. This paper will briefly summarize the background to this situation outline the results of a questionnaire on environmental parameters with nearly 80 participants from 29 countries and make a plea for a shared commitment to adding environmental value to our expanding legacy of phytosociological data.

Session VII. Functional diversity and trait patterns

Chairperson: **Assoc Prof Rosario Gavilan**, Complutense University of Madrid, Spain.

Thursday 7th May

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9:00 – 9:15 / PLANT FUNCTIONAL TRAITS AND DIVERSITY IN SAND DUNE ECOSYSTEMS ACROSS DIFFERENT CLIMATIC REGIONS

Parastoo MAHDAVI, Erwin BERGMEIER

Abt. Vegetationsanalyse & Phytodiversität, Untere karspüle 2, 37073 Göttingen, Germany

** e-mail: pmahdav@uni-goettingen.de*

Functional groups are widely used to reduce the complexity of ecosystems to the limited number of groups instead of dealing with a large number of species. Plants belonging to a functional group show similar response to environmental pressures and might have similar effects on ecosystem processes. Functional groups are particularly suitable for large-scale studies with very different species composition. In this study we aimed to specify the functional groups in sand dune ecosystems relevant across different regions, to find out whether functional groups are influenced by macroclimate or rather by habitat characters, and to define the trait syndromes associated with common habitat types in sand dunes (mobile dunes, stabilised dunes, salt marshes, semi-wet sands, disturbed habitats). A database of 28 trait variables, 309 species and 314 relevés was examined and trait-species, trait-plot and species-plot matrices were built. We used hierarchical cluster analysis to explore the functional strategies of plants in sand dune areas of the Mediterranean, Hyrcanian and Irano-Turanian region. Cluster analysis revealed seven main functional groups, all being represented in each of the three areas. Multivariate analysis showed that functional traits are grouped subject to the habitat types rather than region. We found that the adaptive response of plants to the environment in a certain habitat and ecosystem is similar across climatic regions and that the functional groups are more determined by habitat characteristics and niches. Furthermore, each habitat is correlated with specific functional groups and can be described by specific sets of traits serving as a guideline for maintaining or restoring the habitat. This approach can be used to identify potentially endangered habitats by evaluating the effect of environmental stress (including human activities) on the target functional group, recognize conservation priorities and suggest suitable management.

9:15 – 9:30 / MULTIDIMENSIONAL FUNCTIONAL DIVERSITY- AREA RELATIONSHIPS IN TWO VOLCANIC ISLANDS

Elpida KARADIMOU, A.S. KALLIMANIS, I. TSIRIPIDIS, P. DIMOPOULOS

¹ *University of Patras, Cholomontos 24, Thessaloniki, Greece*

* e-mail: elkaradi@gmail.com

Functional diversity - area relationship has been proposed as a novel method on the trait-based investigation of biodiversity patterns and community assembly. In this study we investigate whether functional diversity correlated with area, what is the shape of the Functional Diversity - Area Relationship (FDAR), if the relationship dependent on the aspect of functional diversity and which model describes best the FDAR. We investigated four plant communities in two sea-born volcanic islands (Kameni Islands, Palea and Nea Kameni, of Santorini Archipelago, Greece) and recorded plant diversity at scales from 1 m² to 128 m². Four multidimensional indices of functional diversity were calculated: functional richness, functional evenness, functional divergence and functional dispersion, but also Rao's quadratic entropy and FD index using 26 functional traits (including vegetative characteristics, ecological preferences, and regenerative characteristics). We used these indices values to construct the functional diversity-area curve for each index. We also constructed the species-accumulation curve in order to compare the patterns. We found that the shape of the FDAR depends on the functional diversity index used. Species richness-weighted metrics display a strong positive relationship between area and functional diversity while abundance-weighted metrics display positive, negative or no significant relationship with area. Multidimensional functional diversity indices should be used to examine FDARs depending on the questions being asked, as each can provide insight into different aspect of functional diversity. FDAR should be considered complementary to the SAR, as it can provide supplementary information especially regarding ecosystem functioning.

9:30 – 9:45 / COMPETITION OR FACILITATION BETWEEN THREE SUBMERGED MACROPHYTES SPECIES

Marcio DA SILVEIRA, Gabrielle THIEBAUT

University Rennes 1, UMR ECOBIO, Avenue General Leclerc, 35042 Rennes, France

* e-mail: gabrielle.thiebaut@univ-rennes1.fr

Invasive aquatic plants constitute a great problem in many freshwater systems worldwide. It has been considered that the plant density is an important factor in explaining invasion success. Plant density is controlling the growth and survival of several species of macrophytes. We investigated experimentally in laboratory in growth chambers the effect of plant density in monoculture and in mixed-cultures on the growth responses of three non-native species of submerged aquatic plants, *E. canadensis*, *E. densa* and *L. major*. These species are close phylogenetically and have a similar ecology and growth form. Our hypothesis is that the invasive species *E. canadensis* is the most competitive species and has the greatest performance independent of the density and of the neighbouring species. We established that growth traits (Relative Growth Rate, number of lateral shoots and number of roots) of *E. densa* and *E. canadensis*, decreased with high plant density compared with the treatments in low densities in monoculture and in mixture. However, *L. major* demonstrated higher relative growth rates in monoculture in high densities, whereas the lateral branches, the root production were reduced in high density in mixed culture. Dense stands of *L. major* stimulated the growth of itself. The growth and the production of lateral shoots and roots of *E. densa* were stimulated by the presence of *L. major* and in less extent by the presence of *E. canadensis*. The presence of other neighbouring species favoured the vigour of *E. densa*. These findings suggested that *E. densa* will be able to develop taller canopies in freshwaters. We showed that *E. canadensis*, because of its growing faster, can provide an ecological advantage over *E. densa* and *L. major*. During the establishment phase of invasion, *E. canadensis* is able to occupy the available space in aquatic environments very quickly, thereby pre-empting the acquisition of resources and space, which could help to inhibit the development of other species. However after this step, *E. densa* and *L. major* are able to grow into larger beds than *E. canadensis* and to displace it.

10:00 – 10:15 / DOES THE FUNCTIONAL DIVERSITY OF CLIFFS AND COASTAL DUNES IMPLY ENVIRONMENTAL FILTERING COMMUNITY ASSEMBLY?

Panayiotis DIMOPOULOS, A.S. KALLIMANIS, Maria PANITSA, I. TSIRIPIDIS, F. XYSTRAKIS

University of Patras, Department of Environmental and Natural Resources Management, G. Seferi 2, 30100 Agrinio, Greece

** e-mail: pdimopoulos@upatras.gr*

Coastal dunes and cliffs are characterized as extreme habitats where the survival demands specific adaptations. The prevailing unfavorable conditions imply that the plant communities of these habitats follow the environmental filtering community assembly mechanism. Other habitats in close vicinity (like forests and grasslands) are not facing such extreme conditions and community assembly is expected to be driven by biotic interactions (like competition and dispersal limitation). In order to test these hypotheses we analyzed the plant functional diversity in vegetation plots corresponding to different habitat types in the Aegean islands. Under the environmental filtering assembly rule, the functional diversity values are expected to be lower than under the random assembly mechanism, while under the limiting similarity mechanism, the functional diversity values are expected to be higher than under the random assembly mechanism. As study area we defined the different phytogeographical regions of the Aegean Archipelago (North Aegean, West Aegean, East Aegean, Kiklades, Kriti and Karpathos). We quantified plant functional diversity using traits like the species ecological preferences (Ellenberg values), their life-forms, their growth forms as well as other traits concerning characteristics such as taxa morphology and their dispersal mode. We estimated different facets of functional diversity using indices like Functional Richness, Functional Evenness and Functional Divergence, and compared the values recorded in the different plots with the ones expected under the random community assembly rule, using as species pool the species recorded in the phytogeographical region.

10:15 – 10:30 / CO-OCCURRENCE BASED MEASURE OF HABITAT SPECIALIZATION FOR SPECIES OF CZECH FLORA

David ZELÉNY

Department of Botany and Zoology, Masaryk University, Kotlarska 2, Brno, Czech Republic

** e-mail: zeleny.david@gmail.com*

Species habitat specialization is an attractive ecological concept, which is unfortunately not easy to quantify due to a lack of good quality field or experimental data. An interesting work around introduced by Fridley *et al.* (2007) assumes that the co-occurrence of target species with other species across a range of localities is a good surrogate indicating whether the target species is a specialist or generalist. The point is to track the target species in vegetation samples across large number of localities to see whether it occurs systematically with similar set of species (specialist occurring repeatedly on similar habitats) or with range of different species (generalist occurring on a wide range of habitats). There are several issues which I attempt to solve in this study. First, there are at least five different algorithms introduced in literature for calculating the co-occurrence based measure of habitat specialization. But which of them is the most reliable? I tested this question using several types of artificial community datasets with different properties, and concluded that Whittaker's beta diversity algorithm (proposed by Zelený 2009) and pairwise-Jaccard or multiple-Sorensen algorithms (Manthey & Fridley 2009) perform similarly well. Additionally, Whittaker's beta has a nice property that it quantifies across how many "idealized" communities given species occurs. Further, I used data from Czech National Phytosociological Database with ~100.000 vegetation plots sampled across wide range of habitats and vegetation types, and calculated specialization for more than 1500 species with sufficient frequency. Using these data, I asked several empirical questions: Does the sorting of species along the gradient from generalists to specialists make an intuitive sense? How is the species habitat specialization related to some of basic functional traits and to Ellenberg indicator values? Are specialists those species often being recognized as diagnostic for associations/alliances? Are generalists more frequent than specialists? And can this concept be of any interest to a vegetation ecologist wondering what to do with large vegetation datasets? Generally, I feel it's time to properly reflect the real meaning of various elusive values numerically derived from large datasets, and to confront them with expert knowledge and empirical experience. I will try my best to use this concept as an example how to possibly do this.

10:30 – 10:45 / SPLOT 2.0 RELEASED: THE GLOBAL VEGETATION-PLOT DATABASE FOR ADDRESSING FUNDAMENTAL ECOLOGICAL QUESTIONS

Jürgen DENGLER, Helge BRUELHEIDE, Oliver PURSCHKE, Stephan HENNEKENS, Milan CHYTRÝ, Ute JANDT, Florian JANSEN, Borja JIMÉNEZ-ALFARO, Jens KATTGE, Jonathan LENOIR, Valério D. PILLAR, Brody SANDEL, Marten WINTER, the sPlot Consortium

University of Bayreuth, Universitätsstr. 30, Bayreuth, Germany

** e-mail: juergen.dengler@uni-bayreuth.de*

Vegetation-plot databases offer new avenues for fundamental ecological research as well as applied questions as they combine fine-grain species co-occurrence data with large spatial extents. The last two decades have witnessed the establishment of successively larger such databases, first at regional, then a national scale. In our talk, we report on the first truly global vegetation-plot database, covering all ecozones of the world and all continents: sPlot 2.0. sPlot has been developed by an international Working Group, based at the Synthesis Centre (sDiv) of the German Centre for Integrative Biodiversity Research (sDiv) Halle-Jena-Leipzig, and meanwhile having about 200 members worldwide (see <http://www.idiv.de/de/sdiv/workshops/workshops-2013/splot>). After two years of preparatory work and several workshops, the release 2.0 of sPlot comprises more than 1,000,000 geo-referenced plots from about 100 countries. They come from about 100 regional and national and a few supra-national databases. In Europe, the European Vegetation Archive (EVA) of the EVS serves as exclusive partner for sPlot, while recently the Tropical African Vegetation Archive (TAVA) has assumed a similar role for large parts of Africa. Technically, the data are handled with a prototype of the software TURBOVEG 3, which supports the combination of many TURBOVEG 2 databases with different species lists and dictionaries on a single platform from which unified outputs for data analysis can be drawn as well as the management of meta-data and author rights. The data use in sPlot follows Governance and Data Property Rules (available on the homepage) and is supervised by an elected Steering Committee. According to these Rules, the data remain property of their contributors and they can be provided by sPlot only (a) for research projects of Consortium members that (b) study global or at least continental-scale patterns. With the release of sPlot 2.0, a first series of analytical studies will be started, which largely benefit from the close cooperation of sPlot with the global plant trait database TRY. Approx. 70% of the most frequent species are represented by at least one trait in TRY, and gap-filling techniques allow an even better coverage. The sPlot analyses in 2015 will focus on topics such as variability of trait-environment relationships across the ecozones of the world, scale-dependence of plant diversity patterns, and relationships between neophytic species and their host communities.

Session VIII. Dynamics and conservation of dune vegetation

Chairperson: **Rense Haveman**, Central Government Real Estate Agency, the Netherlands.

Thursday 7th May

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11:15 – 11:30 / SCRUB DYNAMICS IN BELGIAN COASTAL DUNES

Sam PROVOOST

Research Institute for Nature and Forest, Kliniekstraat 25, 1070 Brussels, Belgium

* e-mail: sam.provoost@inbo.be

During the past century, the share of scrub in northwest European coastal dunes substantially increased. Scrub has an important nature conservation value, appreciated within the European Habitat Directive as different Natura 2000 habitat types. From a management perspective however, scrub is rather seen as a nuisance as it encroaches species rich herbaceous vegetation. Currently, removal of scrub is frequently used as a tool for habitat restoration. Both the ecology of the different scrub types and the vegetation dynamics provide relevant information for site management. In this paper we focus on the major constituents of dune scrub in De Westhoek nature reserve in Belgium: *Hippophae rhamnoides*, *Salix repens* and *Ligustrum vulgare*. We investigate a number of these species' characteristics in order to explain their relative competitive position. These are confronted with the changes in scrub composition, derived from aerial photographs and field mapping. Furthermore, permanent vegetation plots are used to survey vegetation changes since the late 1990's induced by grazing management. Dune scrub development occurred in three major phases. A first phase, during the first decades after WW2, was characterised by rapid scrub expansion in formerly grazed dune slacks. A second phase in the 1970's and 80's mainly consisted of the shift in relative abundance of the three main species. The weakest competitor *Salix repens* showed a strong decline at the expense of *Hippophae* and *Ligustrum*. In a third and last phase, scrub either decayed or matured and succeeded into tall scrub and woodland. Decay of - mainly *Ligustrum* - scrub results in the development tall grass vegetation dominated by *Calamagrostis epigejos*. This offers opportunities for development of species rich herbaceous vegetation through (grazing) management. However, the decline of tall grass cover also stimulates rejuvenation of *Hippophae*. Efficient dune management will have to take into account the specific ecology and dynamic nature of the scrub but also its intrinsic value should not be neglected.

11:30 – 11:45 / USING ECOLOGICAL TRANSECTS TO EVALUATE VEGETATION CHARACTERISTICS OF COASTAL DUNES HABITATS OF MIANKALEH BIOSPHERE RESERVE, NE IRAN

Alireza NAQINEZHAD, Zeinab Kazemi GORJI, Shahryar Saeidi MEHRVARZ

University of Mazandaran, Department of Biology, Faculty of Basic Science, P.O.Box: 47416-95447, Babolsar, Iran

* e-mail: anaqinezhad@gmail.com

Because of importance of coastal ecosystems of southern Caspian areas and their sensitive situation to anthropogenic effects, studies on plant community structure and their vegetation-environmental relationships are considered to be in priority for conservational purposes. Miankaleh Biosphere Reserve in south-eastern shores of Caspian Sea (N. Iran) are known with its complex marine and land ecosystems. The area has 67.349 ha surface and includes a vast range of habitats from mobile sand dunes in the sea shores to fixed dunes with shrubland vegetation, wet depressions and aquatic wetlands. The current research aims to investigate specifically on flora and vegetation of sand dunes (mobile and fixed) and to record the variation of vegetation data along ecological transects from the seashore to distant areas. Vegetation structure, plant diversity, habitat and environmental characteristics have been evaluated using 109 plots of 25 m² along three long transects in eastern, western and central parts of the study area. We applied Bruan-Blanquet method of vegetation sampling. Data were subjected to a modified TWINSpan classification technique (JUICE software) and Detrended Correspondence Analysis (DCA) ordination method (CANOCO software). In order to assess the variation of species-related variables (life forms, chorological data, species richness and diversity) and environmental variables (chemical properties of soil, slope and aspect) among the vegetation groups, we conducted one-way ANOVA analyses followed by post-hoc tests (SPSS software). We determined six different habitats with 314 plant species along the transects. They were classified into eighth ecological species groups with certain number of diagnostic species. The ecological species groups are: *Salicornia europaea* - *Aeluropus lagopoides*, *Arguzia sibirica* - *Cakile maritima*, *Artemisia tscherviniana* - *Daucus littoralis* subsp. *hyrcanus*, *Juncus acutus* - *Saccharum ravennae*, *Tamarix ramosissima* - *Juncus littoralis*, *Rubus sanctus* - *Punica granatum*, *Alnus subcordata* - *Sambucus ebulus*, *Punica granatum* - *Alopecurus myosuroides*. All species-related (except the percentage of chamaephytes) and environmental variables were significantly changed among the vegetation groups. EC and pH of soils were the most important effective factors on separation of the vegetation groups.

11:45 – 12:00 / ASSESSING THE CONSERVATION STATUS OF THE NATURA 2000 HABITAT 2250: COASTAL DUNES WITH *JUNIPERUS* SPP. A CASE STUDY IN PETITE CAMARGUE (FRANCE)

Olivier ARGAGNON, Maud ANTOINE & Lucie LABBÉ

Conservatoire botanique national méditerranéen de Porquerolles, 163 rue Auguste Broussonnet, Montpellier, France

* e-mail: o.argagnon@cbnmed.fr

Since 1992, the European Union committed itself to a better protection of biodiversity through the Habitat Directive. The member States were let free to implement this Directive in their own way. In France, for each Natura 2000 site, it is required to assess the conservation status of each Directive habitats present in the site. This assessment has to be conducted within the boundaries of the Natura 2000 site. If some guidelines are already available to assess the conservation status of some habitats, unfortunately they are lacking for others. Among them is the habitat 2250: Coastal dunes with *Juniperus* spp. It is one the most important habitats of the Natura 2000 site “Petite Camargue” in conservation terms, so we decided to develop a method to evaluate it. We chose to stick to the European texts, even if they were written for monitoring at a scale wider (biogeographical) than a Natura 2000 site. Accordingly, we divided our assessment in three parts: area covered, structures/functions and future prospects. We took in account the ecology of the habitat and the specificity of the site scale monitoring to build several indicators. In order to ease the data gathering process, for some indicators, we resorted to a two-stage cluster sampling. These data allowed us to report an “unfavourable – inadequate” conservation status for the Directive habitat 2250: Coastal dunes with *Juniperus* spp. in the “Petite Camargue” Natura 2000 site. In this communication, we will present our results and discuss the conservation status assessment process which, up to now, lies between the scientific and the regulatory.

12:00 – 12:15 / VEGETATION PATTERN TRANSFORMATIONS IN AN INLAND SAND DUNE COMPLEX FOLLOWING GROUNDWATER DECLINE

Csaba TÖLGYESI, Márta ZALATNAI, Zoltán BÁTORI, László ERDŐS, László KÖRMÖCZI

* e-mail: *festuca7@yahoo.com*

Central Hungarian inland dune ranges harbor heterogeneous grassland vegetation with an extensive network of ecotones, arranged perpendicular to topography driven hydrologic gradients. The area suffers from severe aridification due to climate change and local anthropogenic factors, which have led to a dramatic decline of the water table. As a result, groundwater is no longer reachable for the low-lying plant communities. Since ecotones are frequently the hotspots of ecosystem change, we also focused on them and monitored five ecotones along permanent belt transects for over a decade to characterize their dynamic response, and to identify the internal structural changes of the plant communities the ecotones delimit. Ecotones were delineated with the split moving window technique. The dynamics of two ecotone parameters, namely location and contrast were analyzed with linear regression models using study year – a measure of time since the loss of groundwater – as the explanatory variable. The internal changes of the patches separated by the ecotones were analyzed using plant functional groups. According to our results, the position of the ecotones appeared very stable in time, indicating that their dynamics is not directional but stationary. The contrasts had clear tendencies, leading to the disappearance of two ecotones and to the formation of a new one, while two ecotones showed no trend. The internal changes of the patches were dramatic, with a shift towards more xeric and more open plant assemblages in most stretches of the transects. Thus, the dynamic response of the vegetation complex to the alteration of a key environmental factor was not patch expansion versus shrinking but fusion versus division, which profoundly restructured the vegetation pattern. These features of the studied vegetation processes pose serious difficulties to future restoration plans in the area and also indicate that in situations where stationary ecotone dynamics prevails, ecotone position may be a poor indicator of even strong directional environmental changes but ecotone contrast can serve as a sensitive indicator.

Session IX. Classification and ecology of forest and heathland vegetation

Chairperson: **Dr Neshataeva Valentisna**, Komarov Botanical Institute
Russian Academy of Sciences, Russia.

Thursday 7th May

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13:30 – 13:45 / SETTING FOREST SYNTAXONOMY AND VEGETATION SERIES TYPOLOGY BY NUMERICAL METHODS IN THE SOUTH WESTERN IBERIAN PENINSULA

Jorge CAPELO, J.C. COSTA, C. NETO

Herbarium of the National Institute of Agrarian and Veterinarian Research, Av. da República, Quinta do Marquês, 2780-150 Oeiras, Portugal

* e-mail: jorge.capelo@gmail.com

Setting forest syntaxonomy and vegetation series typology by numerical methods in the south western Iberian Peninsula Numerical syntaxonomy of well-preserved evergreen forests, fringe communities, pre-forest scrub and scrub of SW Iberian Peninsula is presented, based on the author's original relevés and also type and protologue relevés from literature. Moreover, syntaxa apart from floristical consistency are also sought for environmental characterization and interpretation [lythology, bioclimate, physiography]. Nomenclatural implications and comparison with formally-defined syntaxa already described are discussed in the context of relevant vegetation classes: *Quercetea ilicis*, *Calluno-Ulicetea*, *Cisto-Lavanduletea* and *Trifolio-Geranietea sanguinei*. Also, landscape relevés (i.e. sigma-relevés) were also taken and classified numerically so that complete symphytosociological characterization, tables and typology of vegetation series is obtained. Vegetation series mapping is expressed as a current Natural Potential Vegetation (NPV) Map but also expressing zonal vegetation mosaics originating from successional sequences. Classification, ordination –including direct (canonical) and indirect, indicator species ranking, table ordination and environmental envelopes is set as meta-algorithm to stand for a global multi-path consistent data processing strategy and of which the SW Iberian forest, scrub & fringe vegetation is a throughout case-study as the conceptually stable syntaxa and NPV types were obtained.

13:45 – 14:00 / MODELLING THE REGENERATION OF NATIVE FOREST SPECIES IN MAINLAND PORTUGAL: IDENTIFYING MAIN ENVIRONMENTAL DRIVERS

Tiago MONTEIRO-HENRIQUES, Paulo FERNANDES

CEF-ISA-UL, CITAB-UTAD, Av. Principal 110, Campo Benfeito, Portugal

* e-mail: tmh@isa.ulisboa.pt

We aimed to explore which environmental factors are most relevant in tree recruitment in Portuguese forests. We analysed data on saplings, collected in 6840 plots during the 5th Portuguese forest inventory, focusing on tree species that dominate natural forests in mainland Portugal, namely: *Quercus robur*, *Q. pyrenaica*, *Q. faginea* subsp. *broteroi*, *Q. suber* and *Q. rotundifolia*. For each species, we fitted coupled models (generalized linear models with zero inflation, with a negative binomial distribution for the count component and a binomial distribution to estimate the zero-inflated component). We assessed different types of explanatory variables, specifically: two variables relative to the forest environment (basal area, number of trees), two variables concerning wildfires (time since last fire, fire frequency between 1975 and 2006), a spatial variable (the density of neighbouring adult trees), two bioclimatic variables (ombrothermic index of summer quarter, compensated thermicity index), two physiographic variables (aspect, wetness index inverse), an anthropic variable (domestic animal grazing) and a soil-related variable (soil parent material type). Best models were selected using Akaike Information Criteria after full screening of more than 200 000 models for each of the studied species. Depending on the species, different combinations of variables were obtained in the best models. The obtained models showed that, in general, the basal area, the wildfire variables, the density of neighbouring adult trees and the bioclimatic variables are important predictors of forest regeneration. Finally, for the mainland Portuguese territory, we present maps of the sampled regeneration patterns of each species, as well as the maps resulting from the predictions of the fitted models, and discuss them in the light of the Portuguese potential natural vegetation.

14:00 – 14:15 / NORTHEASTERN MONSOON FOREST IN TAIWAN

Ching-Feng LI, Tze-Ying CHEN, Chang-Fu HSIEH

Masaryk University, Kotlářská 2, 61137 Brno, Czech Republic

* e-mail: chingfeng.li@gmail.com

Northeastern monsoon forest dominated by evergreen broad-leaved trees occurs mostly on the subtropical west Pacific islands from Ryukyu to Taiwan (in latitudes of 20°–30°N). Due to a strong wind in winter, this forest is usually shorter than 10 meters with more than 20,000 stems per hectare. In Taiwan, northeastern monsoon forest is distributed from the coast up to 2,000 meters a.s.l. in the northeastern and southeastern ecoregions. It forms a special habitat for rare and endangered species such as *Amentotaxus formosana*, *Cyathea loheri*, *Keteleeria davidiana* var. *formosana* and epiphytic ferns and orchids.

The aim of this study is to find out how many types of northeastern monsoon forest are there in Taiwan and which environmental factors best describe the differences among syntaxa. We used data from National Vegetation Database of Taiwan (AS-TW-001) which contains about 400 relevés collected by standardized sampling method in northeastern monsoon forest, around 1,230 species including trees, shrubs, herbs, lianas and epiphytes and 21 environmental factors provided information about climate, energy input, seasonality and physical soil condition. Using this extensive dataset, we applied Braun-Blanquet phytosociological approach to describe variability of vegetation at the association level, formalize definitions of each association by Cocktail Determination Key and unite their nomenclature according to the International Code of Phytosociological Nomenclature, the third edition. Altitude, moisture and soil rockiness are the most important environmental factors explaining the variance of floristic composition in northeastern monsoon forest in Taiwan. The differences in moisture are caused by the monsoon and the complex mountain terrain. Associations commonly containing gymnosperm usually grow on the habitats with stony soil. We hypothesize that the strength of wind and the amount of salt in the air could have better ability to explain the differences among syntaxa. However, such information remains unavailable till now.

14:15 – 14:30 / LIMITING THE CLIMATIC FACTORS AND HABITATS OF *ERICA TETRALIX* L. AT THE EASTERN EDGE OF ITS DISTRIBUTION RANGE

Liene AUNIŅA, Ainārs AUNIŅŠ

Institute of Biology, University of Latvia, Miera Street 3, Salaspils, Latvia

* e-mail: lsalmina@latnet.lv

The aim of our study was to determine the limiting climatic factors as well as preferred habitats of *Erica tetralix* L. at the eastern limit of its distribution range. Vegetation and habitat studies were carried out in the Piemare Plain, which is the main distribution area of *E. tetralix* in Latvia. We described *E. tetralix* habitats and their floristic and structural composition in 400m² sample plots in tree-covered habitats and in alkaline fen, as well as in 1m² sample plots in grassland habitats. Non-metrical multidimensional scaling (NMS) was applied to determine the main vegetation gradients in communities hosting *E. tetralix*. We used recent field records of *E. tetralix* from literature and private databases to determine the climate niche of the species. *Erica tetralix* is found in nine of 263 cells in a 15.2 x 18.6 km grid overlaid over the territory of Latvia. We created generalized linear models (GLM) to explore the climate niche for *E. tetralix* in Latvia. Results: Pine dominated bog woodland, Northern Atlantic wet heath fragments, alkaline fen as well as species-rich *Nardus* grasslands were habitats for *E. tetralix* in Latvia. Species composition in *E. tetralix* habitats resembled that found in appropriate habitats within its main distribution range, although the habitats in the eastern Baltic region lack many Atlantic floristic elements characteristic for wet heath. Our model suggests that mild winters, expressed as a combination of shallow depth of maximum soil freezing and a large number of days when air temperature exceeds 0°C, as well as abundant annual and winter precipitation are the main factors allowing the presence of *E. tetralix* in Latvia. According to the climatic niche model there are more climatically suitable areas in the Coastal Lowland geobotanical region where the species could potentially be found. We assume that *E. tetralix* in Latvia most likely will be found in bog woodland as due to collapse of traditional land-use and drainage majority of wet heath has turned into bog woodland.

Liene Auniņa received financial support from the European Social Fund Project of Latvia (Project no. 1DP/1.1.1.2.0/13/APIA/VIAA/044).

14:30 – 14:45 / ON THE BORDERS THE TAIGA VEGETATION AND DISTRIBUTION OF NATURAL TAXA *PICEA* IN NORTHWEST EUROPEAN PART OF RUSSIA

Alexandr A. EGOROV ^{1,2}, A.N. AFONIN ¹, L.V. ORLOVA ³

¹ St. Petersburg State University, St. Petersburg, Russia

² St. Petersburg State Forest Technical University, St. Petersburg, Russia

³ Komarov Botanical Institute Russian Academy of Sciences, St. Petersburg, Russia

* e-mail: egorovfta@yandex.ru

In 2009-2010, studies were conducted to distribution natural taxa spruce in the northwest European part of Russia, including Karelia, Murmansk and Leningrad region (Orlova, Egorov, 2011) were identified *Picea obovata* Ledeb., *P. abies* (L.) H. Karst., their hybrid species of *P. fennica* (Regel) Kom. with 3 main forms – typical, close to *P. abies* and close to *P. obovata*. Species of self parental taxa and hybrids of *P. fennica* is still being discussed. In the analysis of the boundaries of the taiga regions and distribution of taxa on the territory, revealed the following patterns. In the sparse taiga of northern mainly occurs *P. obovata* (95%) and the form of *P. fennica* close to it (30%). In the middle of the northern taiga - *P. obovata* (60%), typical form of *P. fennica* (20%) and its form being close *P. obovata* (20%). In the southern part of northern taiga meet all taxa. In communities of middle taiga may dominate *P. abies*, typical form of *P. fennica*, and its form being close *P. abies*. In the southern taiga, there is an absolute dominance *P. abies* (60-90%), sometimes there are all forms of *P. fennica*. It was conducted ecological and geographical analysis of the boundaries of the forests in the area under ecological environmental factors, the most important for the distribution of forest vegetation: the growing degree days (GDD) above 0°C, the average January temperature and hydrothermal coefficient. This analysis showed that some adjacent taiga regions very close ecologically, for example: middle taiga characterized by a range of the GDD above 0°C is equal to 1782-2328 ° C, and southern taiga - 2098-2455°C. However, the southern part of the northern taiga, allocated us to change the relations of taxonomic composition *Picea*, stands out clear confinement to areas with a temperature range 1652 - 1816 ° C, and is characterize by minimal overlap with adjacent forest for values ranges of ecological factors.

Grants: Ministry of Education and Science N2014/181-2220, St. Petersburg State University N0.37.526.2013. References Orlova L.V., Egorov A.A. K sistematike i geograficheskomu rasprostraneniyu eli finskoj (*Picea fennica* (Regel) Kom., Pinaceae) // Novosti sistematiki vysshih rastenij. V. 42. M., SPb., 2011. P. 5-23. (On rus.)

14:45 – 15:00 / *BETULA AETNENSIS* AND *PINUS NIGRA* SUBSP. *CALABRICA*, INTERSPECIFIC COMPETITION WITH A MAIN DRIVER: CLIMATE CHANGE OR VOLCANIC ACTIVITY?

S. SCIANDRELLO, S. BRANCA, P. MINISSALE, G. GIUSSO DEL GALDO

* e-mail: g.giusso@unict.it

Climate change and human pressure play an important role in the development and sustainability of ecosystems and their biodiversity over different temporal and spatial scales. Several Mediterranean habitats, such as deciduous woods, were strongly influenced by long-lasting human activities that significantly led both to structural and floristic modification of the natural phytocoenoses. But these variations are also linked to the physical characteristics of the dwelled sites. Vegetation analyses have been performed on two plant-communities occurring in the supra-Mediterranean belt of Mt. Etna (3328 m a.s.l.), dominated by *Betula aetnensis* and *Pinus nigra* subsp. *calabrica* respectively. These species, together with few other phanerophytes, are the most relevant tree element featuring the highest stands of the volcano. In particular, the narrow endemic *B. aetnensis* colonizes a very small area between 1500 and 2000 m of altitude, chiefly located in the north-eastern side of the volcano, while the endemic Calabrian pine grows between 900 and 2000 m of altitude all around the volcano. The volcanic substratum of the study area is formed by lava flows ranging in age from about 30 ka BP to historical time and by pyroclastic deposits emplaced during the past 12 ka BP up to the present. The most recent eruptions that have impacted this area occurred in 1865 and 1928. The Calabrian pine usually forms bi-stratified woods, and it may be considered as pure stress-tolerant species, characterized by a very high ecological specialization. Whereas, *B. aetnensis* gives origin to paucispecific woodlands growing on very primitive soils, frequently affected by ash fall. Actually, both these species seem to compete for the same environment and, therefore, the predominance of one or the other is linked to different ecological conditions that changed over the last hundred years (e.g. climatic features, forest management and volcanic activity). In order to better understand and define their ideal ecological niches, our study is aiming at (1) delimiting the natural populations of *B. aetnensis* and *P. nigra* subsp. *calabrica*, (2) analysing structure and composition of the surveyed plant communities, (3) estimating diachronic evolution of the populations at issue over the last 80 years, (4) evaluating demographic trends of the *Betula*-dominated plant communities. Finally, we hope to provide more insights on species behaviour in order to improve local protection and management policies.

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Vegetation pattern and mapping

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1 GIS MODELLING FOR THE REALIZATION OF THE MAP OF VULNERABILITY TO DESERTIFICATION OF MASSIF AURES

Hassen BENMESSAOUD

* e-mail: ha123_m123@yahoo.fr

The apprehension of the desertification problem using GIS has advantages over that based on paper. By against in a geographic information system, access to data is digital so that the user can access at any time to the desired data. The methodology is that defined by the MEDALUS project, adapted to the conditions of the southern Mediterranean environment and based on the choice of four factors: soil - vegetation - climate - socioeconomic. These factors are evaluated by quality indices that quantify their ability to resist desertification • IQS: soil quality index • QLI: vegetation quality index • IQC: climate quality index • IQE: Socioeconomic quality index The vulnerability of land to desertification is evaluated by ISD sensitivity index is the geometric mean of the indices of the four factors. Analysis of the results obtained from the different thematic maps shows the importance of desertification threatens virtually all that appears through the different classes of vulnerability to desertification. In fact over 63% of the area of this zone was classified sensitive to very sensitive, while less than 37% are classified as unallocated pretty sensitive land. This study also allowed us to collect the necessary data in a GIS on a harmonized basis for assessing the risk of this phenomenon. The model found using indicators and develop ways of decision support integrating these different parameters.

Keywords: Vulnerability, Desertification, modeling, GIS, Aurès.

2 USING REMOTE SENSING DATA FOR ANALYSIS AND TEMPORAL MONITORING VEGETATION DATA AND DETECTING CHANGES IN THE REGION BOUZINA (AURES)

Moufida MEKAOUSSI, Hassen BENMESSAOUD

University HADJ LAKHDAR, 18 city-BEN FLISS, BATNA, Algeria

** e-mail: moufidamekaoussi@gmail.com*

The functioning of Mediterranean ecosystems daily or internal scale presents an ecological and socioeconomic interest. The intensive exploitation of natural resources of this ecosystem by the people has now reached a critical threshold. To this is added the effect of climate change leading to a drought that occurs mainly in the southern part. This leads to accelerated degradation of the ecosystem and requires the establishment of sustainable management rules. The objective of this study is to determine the contribution of multi-date satellite images in the detection of global change and monitoring changes in the watershed of the Aures Bouzina center. The approach consists of using Landsat satellite images at different times (1986, 2001 and 2013) and sampling work for the confrontation with ground truth to make a thematic analysis of this medium, and view the global changes that have occurred in this area. The overall reading of the results of the tracking map changes, we see a decline in forest cover at an increasing gradient from north to south and led to the reduction of vegetation cover drills. The irrigated areas registered an increase of grain. In favour of bare soil and wetlands, related to the influence of the rivers, as well as the emergence of forage and vegetable crops. Bare soils dominated by a sandy texture are located primarily near areas of crops due to agricultural practices focused on the intensification of agriculture as well as silt soil justified by an increase in bare soil. This work is a first step to monitor degradation or restoration through an ecological indicator field, related to remote sensing data.

Keywords: Detecting Changes; Monitoring changes; Remote sensing, Aurès.

3 THE COENOTIC DIVERSITY AND SPATIAL ORGANIZATION OF OISKIY RIDGE ALPINE VEGETATION (WEST SAYAN)

Evgeny ZIBZEEV, T. NEDOVESOVA

Central Siberian Botanical Garden, Siberian Branch of the Russian Academy of Sciences, Zolotodolinskaya st. 101, Novosibirsk, Russia

* e-mail: egzibzeev@gmail.com

Cartographic modeling and mapping of vegetation is the most important fundamental area of modern geobotanical science. The article presents results of the study investigating the spatial organization of alpine vegetation of West Sayan Oiskiy ridge, and identifying the role of main environmental factors affecting the differentiation of vegetation. The classification of plant communities was carried out using the Braun-Blanquet approach. High and low resolution satellite images (Word View 2, Lansat-7) were processed in Erdas, ENVI and ArcGis-10. The spatial organization of vegetation was modeled on a series of large-scale raster and vector map patterns. They reflect existing plant communities' combinations on micro and meso-levels. The importance of specific environmental and topographic factors was confirmed by analyzing the correlations axes of DCA ordination with the following parameters: slope exposure, slope degree, altitude above sea etc. Four ecological vegetation series have been identified:

- mesophilous ecological series that combines communities of subalpine tall-forb (ass. *Bupleuro longifolii-Stemmacantheum carthamoidis* and *Saussureo latifoliae-Aconitoetum sajanensis*), fir and pine open forest (ass. *Cirsio heterophylli-Stemmacantheum carthamoides* and subass. *Saussureo latifoliae-Aconitoetum sajanensis abietosum sibirici*) developing on automorphic soils.
- hygro-mesophilous ecological series that includes community of subalpine shrubs (acc. *Athyrio distentifoliae-Duschekietum fruticosae*, *Saussurea latifolia-Betula rotundifolia*, *Calamagrostio langsdorfii-Salicetum glaucae*) and subalpine meadows (ass. *Carici altaicae-Allietum schoenoprasii veratretosum*, *Vaccinium myrtillus-Aquilegia glandulosa*) occurring in permanently wet sites. These communities form a vegetation belt at altitudes of 1500-1650 m.
- hemicryophilous ecological series that includes the shrub tundra (ass. *Carici iljinii-Betuletum rotundifoliae*, *Vaccinio myrtilli-Rhododendroetum aurei*, *Vaccinio uliginosi-Rhododendroetum aurei*) alpine meadows (*Salici turczaninowii-Sibbaldietum procumbentis*) and heathlands (*Bergenia crassifolia*, *Vaccinium myrtillus*).
- cryophilous ecological series that includes different combinations of dwarf shrubs (ass. *Festuco sphagnicola-Dryadetum oxyodontae*, *Carici ledebouriae-Dryadetum oxyodontae*), grass (ass. *Schulzio crinitae-Festucetum sphagnicola*) and lichen (*Cladonio-Betuletum rotundifoliae*) tundra.

4 THE OVERALL RESULTS OF THE EU HABITATS INVENTORY IN LITHUANIA

Valerijus RAŠOMAVIČIUS

Nature Research Centre, Institute of Botany, Zaliuju Ezeru g. 49, LT-08406, Vilnius, Lithuania

** e-mail: valerijus.rasomavicius@botanika.lt*

EU habitat types (EU Habitats Directive, Annex I) inventory throughout the territory of Lithuania (65.3 thous. km²) was a huge challenge for the researchers and amateur naturalists. And it was successfully completed in 2011–2014 by the efforts of almost 200 fieldworkers. According to the field research methodology, all sites retaining natural characteristics were visited, habitat types were identified, polygon boundaries were drawn, data on habitat structure and status were collected (including species list, land use patterns, threats, etc.). Original GIS database of habitat inventory was created.

Key figures. 86934 cartographic polygons were distinguished with 53 terrestrial and inland water habitat types, which occupy 427.5 thous. ha area. By habitat groups: forests make up 62%, grasslands – 17%, bogs, mires and fens – 6%, inland waters – 13%, coastal habitats and inland dunes – 2%. Overall, the EU habitats would occupy 6.56% of the country's territory (unexpectedly low number!).

Distribution. Very precise boundaries of the distribution of all habitat types were drawn. At European level, particularly important are boundaries of 9160 Sub-Atlantic and medio-European oak or oak-hornbeam forests, 9190 Old acidophilous oak woods with *Quercus robur* on sandy plains or 91T0 Central European lichen Scots pine forests, which divide biogeographic regions.

Structure. Over seven million entries on the structural characteristics of habitats, including species composition, are accumulated in a database and are waiting for analysis. One of the aspects of the analysis – lists of typical species of habitats and their status.

Status. Evaluation of the main quantitative parameters was performed: intensity of use (e.g. 63.1% of the grasslands are mowed at least once), deadwood amount (e.g. not more than 15% of the inventoried forest habitats possess enough quantity of deadwood), hydrological conditions (e.g. 38% of wetlands are artificially drained), the impact of invasive species, etc. It is expected that habitat inventory material will be used: 1) for the adjustment of boundaries and areas of the Natura 2000 and national protected territories, in preparation and implementation of biodiversity conservation documents, 2) while performing the EIA procedures, 3) for the planning of Rural Development Programme measures, 4) for the implementation of the National Environmental Monitoring Programme, 5) for reporting on the results of implementation of the Habitats Directive.

5 *CAREX FLACCA* SCHREB. IN LITHUANIA - DISTRIBUTION AND ECOLOGY

Domas UOGINTAS

Nature Research Centre, Institute of Botany, Zaliuju ezeru str. 49, Vilnius, Lithuania

* e-mail: domas.uogintas@botanika.lt

In the classical national publications, *Carex flacca* Schreb. is described as growing on calcareous soils, under which dolomite layer occurs. This plant is considered as a classical indicator of calcareous habitats; however, the real ecological behaviour of this plant has not been studied in detail. The aim of this study was to confirm or refuse this standpoint and to develop knowledge about this species ecology. The data on *Carex flacca* range were collected from the herbariums (BILAS, WI) and other data bases (data base of habitat mapping in all Lithuania (BIGIS), national vegetation data base). Phytosociological data were taken from national vegetation data base. The distribution map of *Carex flacca* showed that most observation localities (91%) were in the northern part of Lithuania. In addition, nearly the whole range coincides with the boundary of recession phase of the last glaciation in Central Lithuania (10000–11000 BC). This area is characterized by near-surface layer of dolomites, calcareous soils (carbonates soil layer is 0 to 120 cm depth). The environmental conditions and species ecological behaviour were assessed according to Elenberg's indicator species values. The ordination analysis (PCA) showed that *Carex flacca* may indicate rather wide ecological conditions: it can grow in dry and wet habitats, open and shading areas, in nutrient rich and poor communities. The soil pH values range from slightly acidic to alkaline. The soil reaction and moisture are negatively correlated ($r = -0.75$). The highest soil alkalinity as well as the highest projection cover (2–3 points) of *Carex flacca* was determined in the open and dry communities. Slightly acidic or neutral substrates are dominant in the wet and open communities, while the projection cover of the species varies from + to 2 points. Slightly alkaline or neutral soils are dominant in the shaded and average humidity habitats, while the projection cover of the species is + – 1 points. Since there is an evidence that according to the Elenberg indicator values, the soil reaction evaluation is strongly correlated with the amount of calcium in the soil, it can be assumed that calcium is found in all habitats, thus, the communities are also calcareous, which confirms the patterns of distribution and the classical approach to the indicator properties of this species.

6 USING OF GRID MAPPING FOR EVALUATION OF EASTERN PART OF EUROPEAN RUSSIA FORESTS' COENOTIC DIVERSITY

Nikita KADETOV

Lomonosov Moscow State University, Faculty of Geography, 119992 Leninskie Gory, Moscow, Russia

** e-mail: biogeonk@mail.ru*

Estimation and cartographic interpretation of coenotic diversity distribution are among the most actual problems of contemporary biogeography. Russian scientific school has a great experience of geobotanic mapping, but there is a lack of maps showing distribution of certain syntaxons/plant communities especially in rang of associations and groups of associations/alliances. The method of grid mapping is widely applied in European countries for this porpouse. Russian experience in the use of such methods is not so large. One of the first examples was presented in the monograph "The vegetation cover of Khakassia" (1976), which proposed maps showing the proportion of phytocenoses' areas in a square. One of recent papers is the article by A. Seregin (2013), based on the analysis of diagnostic species' of floristic classification distribution. We attempted mapping the spread of ecological-morphological classification units based on regular grid for the southern taiga and mixed forests in the South-Eastern part of Volga basin. It is based on field materials and published data (more than 100 titles). The average cell size ~ 25 x 25 km, the total number of cells 476. Preliminary distribution maps for 27 groups of associations have been built. It is obvious that, according to the large size and irregular study of the territory, the data requires some additions and revisions. However, the proposed scheme is a useful tool for both ordering and organizing the collection of geobotanical data and its analysis.

7 VEGETATION AND HABITAT MAPPING IN ALBANIA

Michele DE SANCTIS, G. FANELLI, E. GJETA, A. MULLAJ, F. ATTORRE

"Sapienza" University of Rome, Via Ceasre Fracassini 10, Rome, Italy

* e-mail: michedes@gmail.com

In the frame of the IUCN project (2012-2014) "Institutional Support to the Albanian Ministry of Environment, Forest and Water Administration (MoEFWA) for Sustainable Biodiversity Conservation and Use in Protected Areas and the Management of Waste" funded by the DGCS (Italian Development Conservation) the vegetation and habitat (sensu Habitat Directive 92/43/CEE) map of two Albanian Protected Areas (PAs) has been carried out. These PAs were the Buna River Protected Landscape (BRPL) and the Shebenik-Jabllanicë National Park (SJNP). We have first carried out a land cover map through the photo interpretation of the ortophotos covering the PAs. Even though time consuming, photointerpretation has been chosen rather than automatic classification techniques of remote sensing data being less prone to misleading errors, especially in detailed studies with a large number of classes to identify at large map scale. Then we conducted an intensive field campaign aimed to investigate the vegetation through (502) phytosociological relevés and to refine the land cover map. The statistical analysis of these relevés and our expert judgement have allowed the identification of the plant communities and habitat located in the Pas. Using this information we converted the land cover map in the final habitat and vegetation map. The Buna River Protected Landscape comprises both the alluvial plain of the lower course of the Buna river that marks the boundary between Montenegro and Albania, a carbonatic range and a narrow dune system along the Adriatic sea. It extends for about 20.000 ha. According to old descriptions, the Buna Landscape was an impressive wilderness area. Between 1947 and 1980 about 36 km² of agricultural lands were reclaimed, at the expense of wetlands. Despite these changes the vegetation is characterized by a high β -diversity (27 alliances and 46 associations), especially in wetlands and dry grasslands (De Sanctis *et al.* 2015), that host several threatened species listed in the Albanian Red List (eg. *Hydrocharis morsus-ranae*, *Trapa natans*, *Nymphaea alba*, *Butomus umbellatus*, *Pancratium maritimum*). The other PA is the Shebenik-Jabllanicë National Park (SJNP), that extends for 33.928 ha along the border with Macedonia in the centre of Albania. The biodiversity of the SJNP is a complex and dynamic result of several factors: the wide altitudinal range (roughly from 300 to 2200 m), and the land use that, combined with large gradients of geological (conglomerate and sands).

8 USE OF MULTISPECTRAL SATELLITE IMAGES FOR PLANT COMMUNITIES MAPPING

Sébastien RAPINEL, Anne BONIS, Johan OZSWALD, Nicolas ROSSIGNOL, Jan-Bernard BOUZILLÉ

UMR CNRS 6553 Ecobio, Université de Rennes I, Campus de Beaulieu, 35042 RENNES Cedex

* e-mail: sebastien.rapinel@univ-rennes1.fr

Plant communities mapping is a major issue for environmental managers, by meeting the Habitat directive 92/43/EEC requirements on assessment of biodiversity and conservation status of semi-natural habitats. Thereafter, the French Ministry in charge of Ecology has launched the CarHab program which aims to map natural vegetation all over the national territory at 1:25000 scale. Within this framework, this study aims to assess the efficiency and the reliability of multispectral satellite image for plant communities mapping. This approach was tested on the Marais Poitevin region, located along the Atlantic coast. The vegetation of this coastal marshland is mostly composed of various grassland plant communities that are ecologically contrasted but physiognomically similar; making vegetation mapping by satellite challenging. A Pléiades image (2 meters pixel size) was acquired on June 2014. Simultaneously, 115 vegetation relevés were carried out in the field according to the Braun-Blanquet method. The methodology includes two steps: (i) the vegetation typology was derived from an isometric feature mapping (ISOMAP) classification of the field relevés; (ii) satellite image was classified based on a supervised Mahalanobis algorithm. The analysis of ISOPAM classification highlights up to 13 plant communities (e.g. *Alopecuro-Juncetum gerardii*; *Carici divisae-Lolietum perennis*) in relation with flood duration and agricultural practices factors. The result of satellite image classification show that plant communities have been mapped from spectral criteria with a 60% global accuracy index. This study confirms that combining remote sensing data with field data relevés is efficient for producing the tools for biodiversity survey and natural habitats monitoring.

9 SYNTAXONOMICAL DIVERSITY OF VALDAY LAKE AREA AS A RESULT OF NATURAL AND ANTHROPOGENIC FRAGMENTATION OF VEGETATION

Elena BELONOVSKAYA, Alexander KRENKE, Arkadiy TISHKOV, Nadezda TSAREVSKAYA

Institute of Geography RAS, Staromonetny per. 29, Moscow, Russia

** e-mail: belena53@mail.ru*

On the base of the analysis of field investigations and remote sensing data the evaluation of natural and anthropogenic fragmentation of vegetation cover of the National park "Valdaisky" (Novgorodskaya oblast) was carried out. The fragmentation is caused not only by natural environmental peculiarities (diversity of relief forms and soil-forming materials, variety of soils, complexity of hydrographic network, situation on the borders of vegetation zones and geobotanic regions), but also by anthropogenic factors (the old history of land reclamation and arable use of the territory). The analysis of the space images (Landsat 5) show that the average area of relatively homogeneous contour was 1.9 ha, coinciding with the average size of agricultural circuits identified in the assessment of agro-landscape fragmentation. Index of fragmentation of the Valdai landscape within the boundaries of the contours of actual vegetation (pine, spruce, birch forests, meadows) is 0.18–0.24, showing not only the similarity of their genesis (in places of forest clearing and arable lands), but also their existence in the cycle of the agricultural use during centuries. The field investigations revealed that the syntaxonomic diversity of the region is composed by the communities: of the forest (classes *Vaccinio-Piceetea*, *Quercus-Fagetea*); of bogs and swamped forests (classes: *Oxycocco-Sphagnetes*, *Scheuchzerio-Caricetea nigrae*, *Vaccinietea uliginosi* and *Alnetea glutinosa*); meadows (class *Molinio-Arrhenatheretea*). The analysis of actual vegetation allows to reconstruct typologic and physiognomic borders of single contour before agricultural land development. According to preliminary estimations, before appearance of the settled farmers in Valdai region the size range of the indigenous vegetation type varied from a few tens to hundreds of hectares and completely occupied homogeneous elements of mesorelief and contours of similar Quaternary deposits. The nowadays the lack of agricultural use and decreasing of anthropogenic pressure in the Valday region are resulted the processes of widespread reforestation and lowering of biodiversity. Thus, the idea of the maintenances of the anthropogenic mosaic of the region for the conservation of the forest-field-meadow landscape, which is the valuable object of natural and cultural heritage, is proposed. Researches were supported by RFFI grant № 13-05-41392.

10 A MULTITEMPORAL AND MULTIRESOLUTION CLASSIFICATION OF VEGETATION PHYSIOGNOMIES USING OBJECT-BASED IMAGE ANALYSIS

Vincent THIERION, Denis MARECHAL, Marc ISENMANN, Thomas SANZ, Sandra LUQUE

IRSTEA, 2 Rue de la Papeterie, 38402 Saint-Martin-d'Hères, France

** e-mail: vincent.thierion@irstea.fr*

In France, the Ministry of Ecology launched an ambitious project to map the terrestrial vegetation at a scale of 1:25 000 - CarHAB. Initiated in 2011, it will be used as a strategic spatial tool to answer key issues in relation to biodiversity, conservation planning and to report on the conservation status of habitat and species of community interest. The use of remote sensing for habitat mapping over large areas is becoming progressively essential, with the increasing accessibility of multisource images. It provides a good trade-off between multitemporal and spatially accurate information. Based on this factual situation, new remote sensing approach increase discrimination and assessment, respectively, of the dynamic nature of vegetation and of land surface roughness. Hence, multisource image fusion has the potential for integrating vegetation physiognomy and spatial distribution of habitats; while supporting field work and integrating field observations and vegetation inventories from national botanical conservatories on the whole of French territory.

The present research aims at integrating the structure of vegetation (using texture features derived from VHSR SPOT 6 image), its phenological cycle characteristics during the growing season through the analysis of a set of LANDSAT 8 images and topographical contexts. This fusion is based on object-based approach which drastically eases the data mining of those independently generated sets of data. Moreover, given the operational constraints of CarHAB project requiring replication capabilities of the remote sensing methods, we accordingly designed a standard rule-based model of classification that closely reflects a predetermined ontology. Such method gives opportunities to apply the classification scheme on different mountainous landscape by minimizing the observation error and by reducing effort relative to remote sensing technics. The first very encouraging results of this method focus on its replication capabilities and its ease of implementation. An example is given for the mapping of vegetation physiognomy on different open mountainous areas in Isere department (France).

Describing habitats and underlying patterns

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11 CLASSIFICATION PROBLEMS OF THE STEPPE VEGETATION OF THE DON RIVER BASIN

Olga DEMINA

Karachay-Circassian State University, Lenina street 29, 369200 Karachaevsk, Russia

* e-mail: ondemina@yandex.ru

The steppes of the Don River Basin belong to the *Festuco-Brometea* class, which in the regions comprises two alliances, six suballiances, 21 associations and 43 subassociations. The *Festucion valesiacae* Klika 1931, the most important steppe alliance in the region is composed of the *Bupleuro falcate*-*Gypsophilenion altissimae* Averinova 2005, *Phlomenion pungentis* Saitov et Mirkin 1991 and new suballiance – *Festuco rupicolae*-*Stipenion pennatae* Demina 2012 and *Cleistogeno bulgaricae*-*Jurinenion stoechadifoliae* Demina 2012. I am planning to up-rank the suballiances *Phlomenion pungentis* and the *Festuco rupicolae*-*Stipenion pennatae* to the rank of the alliances representing the Western Black Sea steppes and the Eastern Black Sea steppes, respectively. Semi-desert steppes dominated by sub-shrubs and bunchgrasses on solonetz-like chestnut soils in the southeastern part of the Rostov Region, belong to the *Tanaceto achilleifolii*-*Artemisenion santonicae* Demina 2012. The sub-saline steppes of the Western Black Sea and Pontic-West Caspian regions are considered to be a new suballiance – the *Trifolio arvensis*-*Limonienion sareptani* Demina 2012 classified within the latter alliance. The desertified steppes of the Eastern Black Sea and adjacent West Caspian regions belong to a new suballiance – the *Artemisio lerchiana*-*Stipenion lessingiana* Demina 2012. The vegetation on steep chalk sloupes belongs to the *Thymo cretacei*-*Hissopetalia cretacei* Didukh 1989, previously classified within a class in its own right – *Helianthemo-Thymetea* Romashchenko et al. 1996, but today considered as part of the *Festuco-Brometea*. The steppes on deep sands represent zonal vegetation and most probably should be classified within and *Festucion beckeri* Vicherek 1972 (*Festucetalia vaginatae* Soó 1957, *Festucetea vaginatae* Soó em. Vicherek 1972). The halophytic (saline) vegetation of the region is was classified as the *Poo bulbosae*-*Artemisietum pauciflorae* Karpov, Lysenko et Golub 2003 and belongs to *Artemisio pauciflorae*-*Camphorosmion monspeliaca* Karpov 2001 (*Artemisietalia pauciflorae* Golub et Karpov 2005, *Festuco-Puccinellietea* Soó ex Vicherek 1973).

12 THE HABITATS OF ITALY IN THE PERSPECTIVE OF THE FORTHCOMING RED LIST OF EUROPEAN HABITATS

D. GIGANTE, A. ACOSTA, E. AGRILLO, S. ARMIRAGLIO, S.P. ASSINI, F. ATTORRE, S. BAGELLA, G. BUFFA, L. CASELLA, C. GIANCOLA, G. GIUSSO DEL GALDO, C. MARCENÒ, G. PEZZI, R. VENANZONI, Daniele VICIANI*

University of Florence, via G. La Pira 4, Florence, Italy

** e-mail: daniele.viciani@unifi.it*

As many other European countries, Italy is contributing to the forthcoming Red List of European habitats, based on a DG Environment feasibility study (Rodwell *et al.* 2013). The adopted habitat classification is an implemented version of EUNIS including a phytosociological reference to the European Vegetation Checklist (Mucina *et al.* in progress). The assessment is based on a revised version of the IUCN criteria and requires quantitative data derived from habitat maps or grid-based distribution measures. Starting from the large though patchy knowledge currently available for the Italian habitats and plant communities, first task of the research group was to acknowledge from the European list all the plant communities occurring in Italy. Besides "Carta della Natura", a map of habitats based on CORINE Biotopes classification available for half of the Italian Regions, a useful source of information was the Map of Potential Natural Vegetation of Italy (Blasi, 2010) which, overlapped with Corine Land Cover, provided relevant data about the distribution of some habitats. The Prodrôme of the Italian vegetation (Blasi *et al.* 2014) was also a source of phytosociological cross-references, together with the Italian Interpretation Manual of Directive 92/43/EC Habitats (<http://vnr.unipg.it/habitat/>). The present contribution shows the state of the art of the project in Italy. Works are still on-going (e.g. improvement of habitat definitions, assessment, etc.), however with its 151 habitat types at present identified Italy hosts more than 60% of those listed for the whole Europe. A critical point, shared by the majority of the Southern European countries, is represented by the very poor availability of past spatial/quantitative data, which stands as a strong constraint to the application of the criteria adopted for the assessment. Despite some points still need to be definitely improved, the project stands as an outstanding effort aiming at coordinating and harmonizing the knowledge on habitat conservation both at national and continental scale, thus laying the basis for further joint researches and highlighting the huge information gap that should be filled in the shortest possible time.

13 STRUCTURAL AND CHOROLOGICAL DIVERSITY OF HALOPHYTIC VEGETATION IN THE REPUBLIC OF MACEDONIA

Andraž ČARNI, Vlado MATEVSKI, Renata ČUŠTEREVSKA

ZRC SAZU, Institute of Biology, Address: Novi trg 2, Ljubljana, Slovenia

* e-mail: carni@zrc-sazu.si

The research took place in the western part of the country. There exist two main areas of halophytic vegetation in the area. One in the area of Ovče Pole and the other is around Krivolak in so called steppe region. The main difference if these two areas is soil structure, the halophytic vegetation on Ovče Pole develop on developed soil (solonchak and more saline solončak) that are linked to high ground water. Whereas the communities on Krivolak area in the steppe region develop on undeveloped soil: on sand and small partitions of marl, on soil that develop towards solonchak. Both regions are situated close to each other and grazed by sheep, so they share the species pool. The aim of the study is to compare the structural differences between these two types of vegetation and to find out if salinity is the main factor causing the differentiation of vegetation. We collected all published and unpublished data and perform numerical analyses. Then we estimated differences by indicator values, life forms and chorotypes. According to numerical analysis we divided vegetation into six groups, the main division reflects the vegetation on developed and undeveloped soils, and the subdivisions reflect the degree of salinity within each main cluster. We found out that the vegetation that appear on solonchak (developed soils) is more salted than that over sand and marl (undeveloped soils). We compared two groups along the salinity gradient. On solonchak on the most salted sites vegetation dominate therophytic species, but on less saline sites hemicryptophytes and geophytes become more abundant. On sands and marls, on the extreme salted sites we can find more chamaephytic species that are practically missing in the solonchak sites, and vegetation is dominated by therophytes and hemicryptophytes on less salted sites. Comparison of chorotypes reveal that on solonchak in the extreme salted sites cosmopolite species dominates, whereas in the less salted sites the most abundant species are of Eurasian and boreal origin. On sands and marls in the most salted sites Balkan and Anatolian species dominate, whereas in less salted sites we can find sub-Mediterranean species. According to the result we can conclude that salinity is not the most important factor in formation of vegetation. The analyses show that substrate is more important in formation of these communities, but we cannot neglect the role of genesis/evolution of vegetation.

14 GEOSYMPHYTOSOCIOLOGICAL APPROACH OF FRENCH ATLANTIC COASTAL ROCKY CLIFFS VEGETATIONS

Frédéric BIORET, Charlotte DEMARTINI

Institut de Geoarchitecture, 6 avenue Victor Le Gorgeu, Brest, France

** e-mail: charlotte.demartini@univ-brest.fr*

Coastal cliffs vegetations are spatially organized in parallel belts, according to ecological gradients characterised by salt spray deposition, wind exposure, relief energy, substrate nature and depth. Along the french atlantic coasts, a recent research programme set up in 2012 is dedicated to geosymphytosociological approach of coastal vegetations (Demartini *et al.* 2015). The present work focuses on permanent vegetations of the french atlantic coastal rocky cliffs, corresponding to permaserie (Rivas-Martínez 2005, Lazare 2009). Permaseries occurring within homogeneous geomorphological units are listed within geosynrelevés. The analysis of a set of geosynrelevés realised from north of France up to Charente-Maritime, allows to characterise phytocoenotical diversity and to propose a preliminary typology of coastal cliffs vegetations. This analysis completes Géhu's works about sigmassociations description of french atlantic cliffs (Géhu, 1977).

15 CLASSIFICATION OF CONTINENTAL HALOPHYTIC GRASSLAND VEGETATION OF SOUTH-EAST BALKAN

Milica PETROVIĆ, Zora Dajić STEVANOVIĆ, Svetlana AČIĆ, Ivana GAJIĆ, Urban ŠILC

* e-mail: mpetrovic.azs@gmail.com

Syntaxonomic review of halophytic grassland vegetation of Southeast Balkan was performed according to floristic, ecological and biogeographical characteristics of the studied area. Results were compared with current phytosociological classification. Research was performed in North Serbia (Pannonian plane), south Serbia, the Southeast Balkan (Romania, Bulgaria, Macedonia). The set of 1778 relevés of published and unpublished sources originally classified into classes *Thero-Salicornietea* and *Festuco-Puccinellietea* was analysed. Heterogeneity-constrained random resampling of dataset was performed, following original authors classification. Outlier analysis (PC-ORD 5) enabled exclusion of relevés that deviated in species composition and species occurring only once in the database. Final dataset contained 1693 relevés; total number of species was 367. Cluster Analysis of the dataset in the PC-ORD 5, using Euclidian distance measure and Ward's method algorithm for dendrogram construction was performed. Diagnostic species of each cluster were determined using the phi-coefficient as a fidelity measure. Dividing of the whole data set into two clusters has resulted in clear distinction of relevés into those developed on moderately dry to dry habitats corresponding to the class *Festuco-Puccinellietea*, while the rest of relevés was associated to wet saline habitats from *Thero-Salicornietea* class. The classification was best interpreted at the level of 13 clusters to reach lower syntaxonomic units. The vegetation changed along the moisture and salinity gradient, as well as climate and biogeographical characteristics. Cluster analysis shows that alliances of the class *Festuco-Puccinellietea* are distributed along habitat's moisture gradient, ranging from saline wet and moderately wet and slightly salinized vegetation towards dry meadows, while alliances of the *Thero-Salicornietea* class are clearly distinguished as saline swamp vegetation type. Classification of inland halophytic vegetation of the Southeast Balkan upon large scale.

16 REVISITING OLD PHYTOSOCIOLOGICAL SURVEYS TO ANALYZE THE DYNAMICS OF MEDITERRANEAN DRY GRASSLANDS

Marie DOUARRE, Didier ALARD, Thierry DUTOIT

** e-mail: thierry.dutoit@imbe.fr*

In the plain of La Crau (South-eastern France), numerous ecological restoration operations of the unique sub-Mediterranean dry grassland steppe (10 000 ha) have been realized in the beginning of the 21th century. This plant community which has been traditionally grazed since the Neolithic is now considered as a reference for the restoration but this dry grassland may have also suffered from the effects of climate changes and / or changes in land uses such as the grazing practices. We therefore propose to revisit the old phytosociological relevés made since the second half of the 20th century in the dry grassland and various stages of its transformation. It is indeed important to know if this dry grassland plant community is still the same than that of the historical community and eventually to explain new potential dynamics. The method of resampling historical records is an alternative method of chronosequence approach to study the trajectories of plant communities in the long-term without the risk of confusing the space with time. The historical and recent data on the vegetation of the La Crau plain will thus be compiled from articles, theses and phytosociological relevés already available in databases. Resampling will be conducted in spring 2015 to the nearest places from those of the old records. The expected results are that the dry grassland reference trajectory will show some links with the impacts of climate changes and / or land-use changes but lower than those of the formerly transformed areas. For degraded areas, they will evolve more slowly towards the reference state than sites where restoration operations were carried out, confirming the effectiveness of these operations on the medium term.

17 MULTI-SCALE APPROACH OF MEDITERRANEAN DRY GRASSLANDS DISTRIBUTION IN SOUTH-EASTERN FRANCE: DISENTANGLING THE EFFECTS OF PAST AND PRESENT ANTHROPOGENIC IMPACTS ON THEIR TEMPORAL AND SPATIAL DYNAMICS

Anne AURIÈRE, Frédéric BIORET, Thierry DUTOIT

* e-mail: thierry.dutoit@imbe.fr

The Mediterranean basin is one of 34 hot spots of biodiversity in the world. His important biodiversity can be particularly correlated with the millennia of interactions between vegetation and man. It's particularly the case of sub-steppic rangelands (*Thero-Brachypodietea*) which are composed of heterogeneous vegetation patterns even if they are constituted by only one herbaceous layer. The question of the existence of cycles or successional trajectories under recurrent disturbances (grazing and burning) is then major to understand their functioning. The soil and the climate induce also different plant communities at the regional and local scale, with highly specialized vegetation in the form of small-scale mosaics, themselves entangled in systems which covering larger areas. Our project's main objective is therefore to study the variability of these plant communities. Our methodology is based on an analytical investigation of the causes of the variability by the study of the different plant communities of these rangelands to better understand their functioning, including whether if their fine spatial distribution allows us to identify their cyclical dynamic or temporal successional trajectory. The proposed study will be to implement, in sub-steppic rangelands of Western Provence and of the La Crau plain, typological and cartographic methods of landscape phytosociology. Indeed, it will include both dynamic and spatial aspects of their integration at different community scales. This method seems particularly suited to the study of herbaceous vegetation gradients subjected to stress and recurrent disturbances. A methodology for nested approaches is then proposed to better understand the links between the different levels of organization. Particular attention will also be paid to the sub-steppic dry grasslands series of the La Crau plain to identify whether the observed spatial distributions, based on current or past grazing practices, allow the identification of successional trajectories of this herbaceous vegetation in the long term.

18 VEGFRANCE: A FRENCH DATABASE FOR A BETTER KNOWLEDGE OF THE NATIONAL VEGETATION

Anne BONIS, Jan-Bernard BOUZILLÉ, Cloé LEVOINTURIER-VAJDA

UMR CNRS 6553 Ecobio, Université de Rennes I, Campus de Beaulieu, 35042 RENNES Cedex

* e-mail: cloe.levointurier-vajda@univ-rennes1.fr

VegFrance is a French national project which aims to improve knowledge of French vegetation and their use for management and conservation purposes by setting up a national database. This database gathers every available data describing vegetation: (i) at the plot level, describing local communities; (ii) as 'Syntaxon' i.e. as synthetic relevés; (iii) at the 'Landscape' scale. Only seven fields has been identified as mandatory for characterizing vegetation relevés, then opening the French national vegetation database to a large panel of recent and ancient datasets. The aims of VegFrance database are to emphasize the existing potential of data (via metadata) and to use them in order to build typologies and run more robust analyses of methods and processes. Diversified data, in terms of localization or acquisition date for instance, would be used. VegFrance will thus constitute a precious database to address issues regarding management and conservation of species and habitats, as well as fundamental challenges. The French ministry for ecology and sustainable development is supporting these objectives and accordingly funds the project, as well as the University of Rennes and the CNRS (National Center for Scientific Research, units ÉcoBio and OSUR). Data gathered in VegFrance can be royalty-free, subject to royalties or to sui generis rights for already set-up databases. A charter as well as a convention, in order to address the largest range of situations, has already been written. Solutions for metadata viewing on the VegFrance website are currently on progress. Such a free viewing of metadata may lead to further collaboration between providers and potential users of data. On this day, the structure of VegFrance database is stabilized and respects the European rules for data delivery and exchange (INSPIRE Directive and French SINP). We will present the three kinds of data dictionaries, as well as available supports to guide organisms or people willing to contribute to improvement of VegFrance (charter controlling use of data, convention to provide data with protection for royalty-bearing data, data models, ...).

19 A ROADMAP FROM VEGETATION DATABASE TO VEGETATION ANALYSIS, CLASSIFICATION AND MAPPING

Laura CASELLA, Emiliano AGRILLO, N. ALESSI, A. DE MARCO, F. FORNASIER, P. ANGELINI, F. ATTORRE, M. MASSIMI, Francesco SPADA, M. VITALE, C. WELLSTEIN

Istituto Superiore per la Protezione e la Ricerca Ambientale, via vitaliano brancati 60, Roma, Italy

* e-mail: laura.casella@isprambiente.it

Habitat classification is a crucial point for legal and applied implications related to nature conservation in Europe. European Directives (Habitat, Inspire, NEC) impose a common nomenclatural equipment to set management practices and networks for biodiversity conservation. As for the protection of species nomenclatural question is almost limited to cases of taxonomic revision, in the case of habitats far been lacking an official and shared nomenclature with comparative descriptions of the units to protect or assess. A consistent habitat classification is today still controversial, affecting the rationale in species assessments, dynamics and, ultimately, nature conservation policies. A system hardly consistent with the need of a unifying product at the continental scale has therefore established. The CORINE Biotopes first, the revision of Palaeartic and EUNIS, and nomenclatures derived from them (in particular those of the habitats of Annex 1 of the Habitats Directive) have sought to meet precisely this need. Many countries rely on this nomenclature for the definition of habitats on national territories. Europe is setting up a review of EUNIS nomenclature in order to make it more consistent with both the territorial reality and the methodology innovations. In particular has emerged noticeable need to use large database to make descriptions more consistent. In this direction global initiatives for the organization of large databases (GIVD, GBIF and, in Europe, European Vegetation Archive) received institutional recognition entering as processing tools also in legal framework (see the "Review of EUNIS classification", "The Red List of European Habitats" Project). The availability and use of larger databases covering larger areas has no merely quantitative advantages. It provides a solid basis for taxonomical consensus since it often considers the total range of the involved species and inevitably leads to a revision not only of taxonomy but also triggers a sound reassessment of their systematic. Our experience with the current, established classification procedures, points out, when applied to large vegetation databases (although restricted to the national level), their powerful synergism in reducing bias in syntaxonomy, producing a much more sound system of biogeographically consistent units. A federated database of about 19000 georeferenced relevés from vegetation databases "BVN/ISPRA" and "GVD/La Sapienza", participates in these initiatives. Applications that see already implicated the data contained in the archive aim to: formulate a EUNIS classification and mapping valid nationwide from field data also by integrating all available information at site (environmental parameters) and species (functional traits) level; develop niche models and predictive maps associated, to assess the resilience of species and communities to pollution related global changes. The goal is to identify procedures and protocols integrated to support institutional activities on the protection of biodiversity in different fields at both national and European scale.

Functional diversity and trait patterns

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20 CALENDULA MARITIMA GUSS., A CRITICALLY ENDANGERED PLANT ENDEMIC TO W SICILY: HABITAT DEGRADATION, NICHE SHIFT AND SURVIVAL EXPECTANCE

Salvatore PASTA, Giuseppe GARFÌ, Francesco CARIMI, Corrado MARCENÒ

Department of Botany and Zoology, Masaryk University , Kotlářská 2, Brno, Czech Republic

* e-mail: marcenocorrado@libero.it

The sea marigold, *Calendula maritima* Guss., is endemic to W Sicily and is listed among the fifty most threatened plants living on the Mediterranean islands. It used to live in the coastal habitats linked to sand shores close to Trapani, which underwent dramatic deterioration and fragmentation processes during last 30 years due to increasing human disturbance. *C. maritima* is also menaced from hybridization with the congener *C. fulgida* Raf. In order to better understand the present niche width of *C. maritima*, the present abiotic and biotic characteristics of the coastal plant communities where it lives have been investigated. A total of 156 phytosociological relevés was stored by means of turboveg, among them, 127 were recollected during spring 2012, while the other 29 issue from literature. The analysed plots had two different sizes: 1-4 m² plots were used in order to classify present plants communities, while >10 m²-wide plots were used in order to perform a diachronic analysis of vegetation trends. The first analysis allowed to point out the high ecological plasticity of *C. maritima*, which plays a dominant role within 3 different plant communities. The recent niche shift of the sea marigold seems not to have affected neither its frequency nor its cover abundance. On the other hand, the intermediate individuals, which are only present in ruderal communities, could represent a menace for the most disturbed populations.

21 WHICH ENVIRONMENTAL FACTORS DETERMINE DEVELOPING OF COMMUNITIES OF THE STEPPE GRASS SPECIES *CHRYSOPOGON GRYLLUS*?

Aćić SVETLANA ¹, Šilc URBAN ^{2,3}, Petrović MILICA ¹, Topisirović GORAN ¹, Dajić Stevanović ZORA ¹

¹ University of Belgrade, Faculty of Agriculture, Department of Botany, Nemanjina 6, Belgrade-Zemun, Serbia

² Institute of Biology ZRC SAZU, Novi Trg 2, Ljubljana, Slovenia

³ BC Naklo, Strahinj 99, 4202 Naklo, Slovenia

* e-mail: acic@agrif.bg.ac.rs

The steppe species *Chrysopogon gryllus* inhabits habitats of different geological bedrocks and soil types, within dry, semi-dry and even mesophilous grasslands. Ecological factors that are crucial for occurrence and distribution of plant communities with *Chrysopogon gryllus* were analysed. Relevés were collected from the Database Grassland Vegetation of Serbia (EU-RS-002) and 879 relevés with presence of *Chrysopogon gryllus* were analyzed. The cluster analysis was made in the program PC-Ord 5. Climatic variables were exported from WorldClim database and categorical data for soil and bedrock type were used. Habitat conditions were described by Pignatti indicator values. The responses of the species were modelled along the coenoclines using the HOF modelling approach. Cluster analysis indicates separation of the relevés corresponding to the Balkan alliance *Chrysopogono-Danthonion calyciniae* from the large group of relevés of other alliances. This heterogeneous group of relevés was further divided into clusters of steppic grasslands of the *Astragalo-Potentilletalia*, alliances *Festucion valesiacae* and *Festucion rupicolae* and Balkan steppes developed on serpentine (*Halacsyetalia sendtneri*). For indicator values such as moisture, nutrients and temperature, the *Chrysopogon* exhibits unimodal simetric (model IV) or skewed response (model V). HOF curves for indicator values of continentality and soil reaction (model II) showed a gradually increasing response of the species towards its maximal potential cover, whereas for light response an asymptotic pattern below the potential maximum cover was obtained. Among analysed environmental variables, the most relevant was Altitude, followed by climatic variables (Precipitation and Temperature). Bedrock types were significant in explaining occurrence of *Chrysopogon* too, especially Sand, Loess, Limestone and Serpentine. DCA analysis performed on data set of relevés with the highest cover enabled determination of ecological optimums for tested variables. Results could provide anticipation of responses of this C4 grass to climate change due to its high ecological plasticity.

22 DIFFERENT ASPECTS OF FUNCTIONAL DIVERSITY DISPLAY DIFFERENT TYPES OF FUNCTIONAL DIVERSITY - AREA RELATIONSHIPS

Elpida KARADIMOU *, A.S. KALLIMANIS, I. TSIRIPIDIS, Panayiotis DIMOPOULOS

University of Patras, Cholongos 24, Thessaloniki, Greece

** e-mail: elkaradi@gmail.com*

We investigated four plant communities in two sea-born volcanic islands (Kameni Islands of Santorini Archipelago, Greece) and recorded plant diversity in 16 plots and at scales from 1 m² to 128 m². Six multidimensional indices of functional diversity were calculated: functional richness, functional evenness, functional divergence and functional dispersion, Rao's quadratic entropy and FD, using 26 functional traits (including vegetative characteristics, ecological preferences, and regenerative characteristics). For each plot, we constructed the species-accumulation curve and also the functional diversity-area curve for each index. We found that different aspects of functional diversity displayed three distinct types of the FDAR. When quantifying the range of functional traits in the community, there is a strong positive relationship between area and functional diversity (similar to the well-known species area relationship). When quantifying the evenness in the distribution of abundance in the functional space, there is a negative correlation with area. When quantifying the functional divergence, there is no clear pattern with area (i.e. weak to non-significant correlations with area reflecting the community context. This typology of FDARs may prove of general applicability. These findings imply that as area increases, the range of traits observed in the community increases (thus FRic increases); however the abundance of all traits does not increase proportionally, and some traits become dominant (thus FEve decreases) - perhaps implying a focus on some functions rather than in others. The dominant species may possess traits located in the 'centre' of this increased functional space (in which case FDiv increases) or traits located in the margins of this functional space (and in this case FDiv decreases) depending on the characteristics of the rare species that mainly drive the increase of the range of functional space occupied.

23 A COMPARISON OF PREFERENTIAL AND NON-PREFERENTIAL SAMPLING SCHEMES IN THE ASSESSMENT OF VEGETATION-ENVIRONMENT RELATIONSHIPS IN SPECIES-RICH GRASSLANDS

Grzegorz SWACHA, Zygmundt KACKI & Zoltán BOTTA-DUKÁT

MTA Centre for Ecological Research, Alkotmány 2-4, Vacratot, Hungary

** e-mail: botta-dukata.zoltan@okologia.mta.hu*

Preferential sampling is considered to give biased conclusions about vegetation parameters such as species richness, diversity and representation of plant groups like invasive or rare species. In contrast, random sampling is indicated as the only valid or most appropriate way of testing ecological hypotheses. Despite this reservations, data collected either by preferential, random or systematic sampling is frequently used to study the effect of environmental factors and management practices on species composition and vegetation diversity. The aim of this study was to investigate if different sampling schemes provide similar or distinct information on how environmental conditions and management regime impact species composition and diversity of vegetation. We compared analyses of vegetation-plot data collected in *Molinia* meadows of SAC Natura 2000 "Łąki Zagórzycyckie", Poland using different sampling designs: preferential, random and systematic. Preferential collection of data was in accordance with Braun-Blanquet approach, while random and systematic plots were positioned by creating a grid of squares. All vegetation data was recorded from 5 x 5 m plots and collected solely by the first author of the study. For each plot, soil samples were obtained and following measurements were taken: total amount of N, content of organic matter, and content of exchangeable forms of P, K, Ca, Mg. In total, data on vegetation and soil was obtained from 306 plots (ca. 100 per each sampling design). Our analysis points out that non-preferential sampling may lead to over-estimating the strength of correlation between vegetation and environment.

24 WATER CHARACTERISTICS INFLUENCE *EGERIA Densa* GROWTH

Morgane GILLARD, B. COUPE, Carole DELEU, Gabrielle THIEBAUT

UMR CNRS 6553 Ecobio, Université de Rennes I, Campus de Beaulieu, 35042 RENNES Cedex

* e-mail: morgane.gillard@univ-rennes1.fr

Invasive aquatic plants are already highly problematic in many freshwater systems worldwide, and they have had severe impacts on biodiversity and ecological functions in several aquatic ecosystems. *Egeria densa*, belonging to the Hydrocharitaceae family, is one of those invasive macrophytes. By colonizing water bodies, this species form dense monospecific beds which prevent practice of water sport, of fishing, and impede water flow. Thereby, modifications of the uses of aquatic environments by *Egeria densa* lead to high economic costs. This study was conducted in order to analyse the responses of *Egeria densa* to environmental features. We assessed four sites invaded by *Egeria densa* during two years in Brittany (West of France). The water chemical composition was analysed during each campaign. Thirty individuals were collected from each site, and eight morphological traits were measured. Plants were collected from sites characterized by low oxygen content, a moderate to high conductivity, a low phosphate concentration and a moderate to high ammonium level. Our results showed that a correlation exists between water parameters and some morphological traits of plants. The architecture developed by *Egeria densa* depends on nitrate and ammonium concentrations in water. The water composition can influence the morphology of our model, showing that this species is very plastic. Thus, *Egeria densa* ability to respond to a wide range of water quality could explain its colonization success.

25 PRELIMINARY RESULTS OF LONGEVITY TESTS ON SEEDS OF SOME FABACEOUS PLANTS COLLECTED FROM HERBARIUMS

Anett ENDRÉDI*, Kata Mária TÓTH, Dániel CSERHALMI

Szent István University, Páter K. u. 1., H-2100 Gödöllő, Hungary

* e-mail: anett.endredi@gmail.com

Regeneration capacity of a plant community is always based on the natural seed bank and can be described by the longevity and viability of the actually presented seeds. The aim of this preliminary study was to examine the potential seed longevity of four fabaceous species (with different life-strategies) and the correlation between hardseededness and seed age. Most of the studied seeds were collected from two herbaria collections but these samples were supplemented with fresh seeds from direct collection and seed-exchange programs. Minimum 3 seed samples were used for each species: *Astragalus cicer* (1918, 1925 and 1940), *Astragalus contortuplicatus* (1914, 1918 and 2011), *Astragalus glycyphyllos* (1908, 1909 and 1915) and *Trifolium arvense* (1897, 1900, 1910, 1913, 1922, 1929, 1943 and two different samples from 2012). To evaluate hardseededness scarified seeds were germinated as well. In the experiments, only the seeds of *A. contortuplicatus* from 1914 and 2011, the seeds of *A. cicer* from 1925 and the fresh seeds of *T. arvense* were germinated. In general, scarification increased the germination rate, but elder seeds had less hardseededness. The results show that some fabaceous species can keep germination capability even for 90 years (also in herbariums).

Classification and ecology of dune vegetation

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26 RESTORATION OF INLAND-DUNE VEGETATION (KOELERION GLAUCAE) IN THE UPPER RHINE VALLEY: A 10-YR PERIOD STUDY

Christian STORM, Carsten EICHBERG, Michael STROH, Angelika SCHWABE

Technische Universität Darmstadt, Schnittspahnstr. 4, 64287 Darmstadt, Germany

* e-mail: schwabe@bio.tu-darmstadt.de

The transfer of plant material has become a frequently applied method of grassland restoration. Especially a three-step approach comprising abiotic restoration (reduction of soil nutrients), transfer of plant material and management turned out to be effective. However, the longer-term success has seldom been quantified so far. Here we present the results of an experiment that was established in 2005 on ex-arable land in the Upper Rhine valley, Hesse, Germany. We applied nutrient-poor deep-sand substrate to connect a well-developed *Koelerion glaucae*/*Allio-Stipetum* vegetation complex and an older restoration area by a corridor (250 m x 22 m). One week after its creation, one half of the corridor was inoculated with raked/mown plant material from one of two donor sites, respectively. As a management measure, donkey grazing was applied for appr. three weeks each year. The vegetation of the restoration and donor areas was sampled on permanent plots once each year and analyzed by DCA ordination and target-species ratios (TSR: relation of target species to all species). Ordination indicated a continuous development of the restored plots towards the plots of the corresponding donor sites. Within the first years, this convergence took place in larger steps than in later years. However, after 10 years, restored plots did not show exactly the same plant communities than the corresponding donor sites but also developed new structures. This indicated a mixture of propagules of both donor sites on the receptor site (e.g. by wind and donkeys) and an input from the surroundings. By contrast, composition of donor plant communities remained stable over time. In the first year, three Red List-species established themselves on the restored plots; after 10 years, 22 endangered plant species were present (among them *Koeleria glauca*, *Fumana procumbens*, *Euphorbia seguieriana*, *Alyssum montanum* subsp. *gmelinii*, *Poa badensis*). The TSR values showed a high restoration success: The qualitative values (species numbers) were very near to the donor plots and quantitative values (cover values) similar or even higher. Nevertheless, also some ruderal species colonized the restoration site which lack on the donor sites and have to be continuously managed by donkey grazing. After 10 years we conclude that restoration of inland dune vegetation was successful.

27 INTEGRATING FIELD SURVEY ON GEO-ENVIRONMENTAL FACTORS AND ORTHOPHOTO INFORMATION TO MONITOR COASTAL DUNE HABITATS - A PILOT STUDY TO EVALUATE COASTAL DUNE VULNERABILITY

Fernanda ALQUINI, Giovanni SARTI, Duccio BERTONI, Alessandro POZZEBON, Michele PINZI, Daniela CICCARELLI

¹ *University of Pisa, Via Cristoforo Colombo, 10, Pisa, Italy*

** e-mail: alquini@gmail.com*

Plants play a crucial role in coastal sand dune development, because they interact directly with wind action, preventing sand movement. Vegetation works like an obstacle, in fact it deforms air flow and prevents sediment transport causing the decrease of the energy transfer. The interaction between vegetation, sand and wind shapes the coastal landscape, which is characterised by a sequence of different plant communities in accordance to a sea-inland ecological gradient mainly determined by salt spray, substrate incoherence, nutrient scarcity, water deficit, and high irradiance. Coastal ecosystems can be difficult to monitor effectively in the field because of the heterogeneity and discontinuity of these habitats. Integrating field analysis on several environmental variables with vegetation coverage obtained by orthophotos can be a challenging method to monitor coastal dune habitats. In particular, the aim of the present research is to integrate abiotic and biotic information to develop a vulnerability index in order to determine the conservation status of coastal dunes.

This study has been planned in two pilot sites: Migliarino - San Rossore - Massaciuccoli Regional Park in Italy (Mediterranean Sea), and Acarai National Park in Brazil (Atlantic Ocean). In both sites, the following data will be collected: a) distribution and coverage of the different plant communities classified in three natural cover types (pioneer annual vegetation, herbaceous vegetation growing on embryonic and mobile dunes, shrub and woody vegetation of fixed dunes); b) geomorphological and sedimentological information (such as topography and sediment transport rate); c) acquisition of a set of environmental parameters (wind speed and direction, ground temperature and humidity) by means of wireless sensor technology. Relationships between plant communities coverage, geomorphological and sedimentological data, and environmental variables are investigated through Canonical Correspondence Analysis (CCA). An index of coastal dune vulnerability will be built integrating vegetation condition, geomorphological and sedimentological information, wind influence, and soil parameters. Results from the two pilot studies can be used for management and conservation planning.

28 EVALUATION AND THREAT OF COASTAL SAND DUNE HABITATS IN THE NATURA 2000 SITES OF CRETE (GREECE)

Florian GOEDECKE, Friedemann GORAL, Parastoo MAHDAVI & Erwin BERGMEIER

Dept. Vegetationanalysis & Phytodiversity; Georg-August University Goettingen, Untere Karspuele 2, Goettingen, Germany

* e-mail: fgoedec@gwdg.de

Coastal sandy habitats are among the most endangered ecosystems worldwide and the Mediterranean is no exception. Sand dunes are under threat of habitat loss and degradation chiefly due to touristic activities, urbanization and agriculture. In this study we present results of the ongoing mapping and monitoring of the Natura 2000 sites of Crete. Habitat distribution, conservation status and major threats of sandy habitats are discussed. Dune habitats are represented in Crete by the Annex I habitat types 2110, 2120, 2220, 2230, 2240, 2250 and 2260. Sandy areas within Natura 2000 sites are mostly located in the west, north and east of the island, such as around Rethymnon, at the northwestern shore of the Gramvousa peninsula and Elafonisi. Further important sandy Natura 2000 sites were designated on some of the small islands south of Crete. Other sandy coastal areas near Chania and Heraklion occur but outside Natura 2000. The present conservation status of the habitats differs. Although designated as protected areas, many parts are heavily affected or already destroyed by construction, intensive beach cleaning, waste dumping and trampling. Seashores and associated hind dunes are under particular high pressure in touristic areas. The very rare grey dunes including habitat type 2220 (Dunes with *Euphorbia terracina*) are under immediate threat through construction works in the vicinity of hotel complexes and other touristic facilities. Through disturbance, plantation and waste dumping some competitive plants such as *Phragmites frutescens* and *Oxalis pes-caprae* are spreading invasively, thereby destroying the natural structure and species composition of the grey dunes. Successful conservation efforts can be found at the coast of Elafonisi which may serve as a fairly satisfying example of sustainable and suitable management under the conditions of increasing tourism, the measures mainly benefitting the type 2120 (White dunes) and the priority habitat type 2250 (Coastal dunes with *Juniperus macrocarpa*). We would like to emphasize the urgent need to see the official Natura 2000 network along the Cretan coasts reflected by proper conservation policy and local commitment and stewardship in order to preserve the remaining sand dune ecosystems and to restore the damaged habitats. Otherwise, the rare vegetation types of vegetated sandy beaches will vanish in the years to come.

29 SYNTAXA OF THE COASTAL DUNES IN TURKEY

Fatoş ŞEKERCILER, Nihal KENAR

Ankara University Institute of Science, Hedef Street 9/10 Amltepe, Ankara, Turkey

** e-mail: fatos_sekerciler87@hotmail.com*

Turkey which is located in the temperate region of the world has a rich floristic composition due to its location at intersection points of Euro-Siberian, Irano-Turanian and Mediterranean phytogeographical regions, climatical, topographical and geomorphological, also coastal habitat diversity (sea, lakes and rivers). The length of the coastline of Turkey is 8333 km in all, 845,1 km of the entire coastline are coastal dunes which cover totally 36601 ha areas. These areas located at Aegean, Black Sea, Mediterranean and Marmara regions. The ecological properties, ecosystem status and vegetation dynamics of the coastal dunes are quite important areas in terms of biodiversity. It needs to know the relationships between plants and their habitats because of their specific ecological conditions such as low nutrient-mineral, high salt content and specific plant diversity that adapted to the coastal dunes referred to as psammophile. In this research, it was aimed to overview the phytosociological studies and the sum of the syntaxa of coastal dunes of Turkey.

30 SUBHALOPHILOUS AND HALOPHILOUS GEOPERMASERIES AND CURTASERIES OF SANDY AND SANDY GRAVEL SYSTEMS OF CORSICA: TYPOLOGY, BIONOMY AND SEQUENTIAL ANALYSIS VEGETATION

Pauline DELBOSC ^{1,2}, Frédéric BIORET ¹, Christophe PANAÏOTIS ²

¹ Université de Bretagne Occidentale, EA 2219 Géoarchitecture, 6 avenue le Gorgeu, Brest, France

² Conservatoire botanique national de Corse

* e-mail: pauline.delbosc@univ-brest.fr

The coast of Corsica arouses, for many years, interest of many botanists and phytosociologists (Molinier 1959, Géhu & Biondi 1994, Piazza & Paradis 1997, 1998, 2002), showing the diversity and originality of the vegetation system. Sandy and sandy-gravelly systems punctuate much of the coastal line Corsica (Géhu & Biondi 1994). Because of their accessibility and their attractiveness to tourists, these systems are subject to increasing attendance and urbanization. A synthesis on the vegetation psammophile of the Corsican coast was carried from 2013 to 2014, with an objective of improving phytocoenotics and bioassessments knowledge. Following the methodology phytosociological dynamico-catenale a typology and mapping of géopermaséries and vegetation curtaséries of 24 sites have been realized. This is to establish the dune vegetation sequences "types" according to the nature of the substrate (sand, dune, sand-gravel terrace gravel). The 24 sites are bio-evaluated using a coefficient of phytocoenotic Diversity (Géhu 1979), to identify sites for major conservation issues.

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31 SPATIO-TEMPORAL DYNAMICS OF VEGETATION OF COASTAL DUNES IN SW FRANCE

Béatrice SAUZEAU, Marie Lise BENOT, E. REVARDEL, V. FIEVET, D. ROSBERY, Didier ALARD

Université de Bordeaux, Laboratoire BIOGECO, UMR INRA 1202, Bâtiment B2, Allée Geoffroy Saint-Hilaire, CS 50023, 33615 PESSAC CEDEX, France

** e-mail: beatrice.sauzeau@u-bordeaux.fr*

Global change scenarios, which focus on climate change and habitat fragmentation, involve modifications of spatial distribution of species in response to this change and emphasize the need of functional habitat connectivity. In order to predict and mitigate the effects of climate change we need to identify and understand processes responsible for the spatio-temporal dynamics of plant communities. In that purpose, we need to apprehend how plant survival and growth can be affected by changing climatic conditions, the ability of plant species to move to expand their range (depending on species' dispersal abilities), and to what degree their distribution depends on interactions with other organisms. The Atlantic coastal sand dunes of Southern France (Aquitaine region) provide an ideal opportunity to study these processes. They extend in a narrow, relatively homogeneous and apparently little fragmented strip along a 200km North-South gradient from the Gironde estuary in the North to the Adour in the South, close to the Pyrenees. This area is long enough to encompass a climatic gradient, along which species dispersal can be easily tracked, due to the linear nature of these dunes. Most part of them belongs to the French Government and is managed by the French National Forest Office. A spatially explicit survey of the plant specific composition has been conducted every 6 years since 1997 by the French National Forest Office. Data have been collected in pseudo-circular 100m² quadrats positioned from the inland tree-line ecotone to the beach, along 96 transects perpendicular to the coast separated by about 2.5km. Before a new campaign of surveys in 2015, an analysis based on data of 1997, 2003 and 2009 will be made to identify the different vegetation types at local and regional scales. It will allow showing potential dynamics in space and time of these communities between 1997 and 2009. These results, combined with future studies of the dispersal ability of target plant species, the landscape structure and the history of the coastal sand dunes of Aquitaine region, will provide key information to the French National Forest Office about sand dune management to apply in order to maintain connectivity for species movements along the sand dune strip.

32 CHANGES IN THE VEGETATION OF SAND DUNES ALONG DANUBE RIVER IN SERBIA

Mirjana ĆUK, Ružica IGIĆ, Andraž ČARNI, Miloš ILIĆ, Dragana VUKOV

Department for biology and ecology, Faculty of sciences, University of Novi Sad, Trg Dositeja Obradovića 2, Novi Sad, Serbia

** e-mail: mirjana.cuk@dbe.uns.ac.rs*

This paper presents diversity of vegetation of sands that is distributed mainly along the Danube riverspread mainly along the Danube river. This vegetation often appears on sand dunes and is very fragile and dynamic. Because the humans has tried to fix sand dunes and to convert them to agricultural land since ancient time, many research focused on this object. The first written records about sand habitats in Serbia, their importance, flora and fauna, originate from the mid-19th century. First phytocoenological data about this vegetation in Serbia were collected in 1948. The specific features and classification of sand vegetation of Serbia were topics of vegetation survey in the last 60 years. Special attention is paid to their origin, geomorphological history and economic importance.

In this study, we present the current knowledge of this vegetation, syntaxonomic affiliation and geographical distribution of these communities on the basis of a comprehensive review of data from the literature and our own research in the field. Conducted analysis included data in the time range of almost a century. For this study we have done and analyzed 230 relevés in accordance with the standard Braun-Blanquet approach. All relevés are stored in the database with the help of Turboveg software package. We carried out a comparison of plant communities in relation to their ecological and chorological characteristics (life form spectra-according to Raunkiaer's classification and chorotype-according Gajić's classification), and cluster analysis of dataset with the help of classification and ordination methods by PC-ord software. We also calculated the degree of similarity between established clusters using Sorensen and Ellenberg indices. We analyzed changes in floristic composition and ecological conditions by multivariate techniques, using DCA. For description of ecological conditions Ellenberg's indicator values were used. Changes in sand dune vegetation of Serbia after almost one century were established on the basis of changes in floristic diversity, degree of presence and coverage of diagnostic taxa. Also, we established clear successive stages between pioneering forms of vegetation on the sand and the steppe formations on stabilized sand mass.

33 DUNE HILL IN FOLUSZ NEAR SZUBIN (NW POLAND) - LOST TREASURE

Dariusz KAMIŃSKI, Andrzej NIENARTOWICZ

Chair of Geobotany and Landscape Planning, Faculty of Biology and Environment Protection, Nicolaus Copernicus University, Lwowska 1, 87-100 Toruń, Poland

** e-mail: daro@umk.pl*

Dunes of Toruń-Bydgoszcz Valley form one of the largest inland dune field in Poland, which area is over 980 km². Most of the dunes in these region are covered by pine forests, but some, that have long been deforested, are home to valuable xero-thermophilic plant species and communities. One of these is dune hill in Folusz, located in Gąsawka River Valley, amidst large areas of *Molinia* meadows, within the Natura 2000 area – PLH040027 „*Molinia* meadows in Folusz”. Since the late 19th century dry grassland *Potentillo-Stipetum*, pssamophilous grassland *Sileno otitis-Festucetum*, steppic wood *Potentillo albae-Quercetum* as well as *Stipa joannis* var. *cujavica*, *Anemone sylvestris*, *Aster linosyris*, *Pulsatilla pratensis* were here recorded. Unfortunately dune is mostly privately owned and it has failed to cover it by law protection. The aim of our work was to describe the changes in the dune plant cover between the years 1956-1964 and 2012-2014. We found an almost complete disappearance of dry and pssamophilous grasslands, that have been replaced by *Calamagrostietum epigeji*, and the disappearance or reduction of the size of rare xero-thermophilic species populations. The cause of observed changes are destructive human activity related to exploitation of the sand and afforestation of the dune with pine and birch.

34 PSAMMOPHILOUS SPECIES IN THE CITY LANDSCAPE

Lucjan RUTKOWSKI, Dariusz KAMIŃSKI, Agnieszka PIERNIK, Ilona SZUMAŃSKA

Chair of Geobotany and Landscape Planning, Faculty of Biology and Environment Protection, Nicolaus Copernicus University, Lwowska 1, 87-100 Toruń, Poland

* e-mail: darow@umk.pl

The part of one of largest inland dune fields in Poland is included in the administrative borders of the city of Toruń (N Poland). The dunes were formed chiefly in the Younger Dryas, but probably also in the Older Dryas and even in the Preboreal periods. In the following periods the relief was protected against denudation and eolian processes by a forest cover. In the late Middle Ages the process of dunes destroying began, as the result of deforestation. Many dunes were destroyed in the 18th century, due to the expansion of the city's fortifications and during the expansion of the city in the 19th and 20th centuries, but vastly sandy areas and dunes are still a part of the city landscape. Today the dunes are mostly covered by pine forests, some of them by ruderal plant communities, but the current one is also a typical psammophilous vegetation. The aim of our research was to prepare a list of psammophilous species in Toruń flora, study their distribution and connections with the type of soil and land use. In the current flora of Toruń there is about 100 species of plants strictly associated with dry, sandy habitats (8% of total flora). They are characteristic mainly for the *Koelerio-Corynephoretea*, *Nardo-Callunetea* and *Festuco-Brometea* classes, but also for *Stellarietea mediae* and *Artemisietea vulgaris*. They occur on the outskirts of the city, on rusty soils and podzols, mostly under moderate human activity.

35 HUMAN IMPACT ON SANDY BEACH VEGETATION ALONG THE SOUTH ADRIATIC COAST

Urban ŠILC, Zora DAJIĆ STEVANOVIĆ, A. IBRALIU, M. PETROVIĆ, D. STEŠEVIĆ

Institute of biology ZRC SAZU, Novi trg 2, Ljubljana, Slovenia

* e-mail: urban@zrc-sazu.si

We compare the zonation of vegetation and connectivity of sand dune plant communities between two distinct areas in Montenegro and Albania. They differ in terms of human impact, mainly through touristic activities. The transect method was used to gather data about plant communities, their zonation and connectivity. We found that there are differences between still less impacted and preserved sites and disturbed sandy beaches: transects are longer, richer in boundaries and with a straightforward distribution but contacts in both directions. The less disturbed beach has zonation very similar to potential vegetation, while plant communities of the touristic beach are fragmented or even substituted by replacement communities.

36 LARGE-SCALE PHYTOSOCIOLOGICAL AND ENVIRONMENTAL PATTERNS EUROPEAN ATLANTIC DUNE GRASSLANDS

N.M. VAN ROOIJEN, P. W. HAMEETEMAN, J.A.M. JANSSEN, J.H.J. SCHAMINÉE

Alterra WUR, P.O. Box 47, NL 6700 AA Wageningen, The Netherlands

** e-mail: nils.vanrooijen@bio.kuleuven.be*

The increasing availability of large datasets and modern modelling techniques and statistics make it possible to analyse patterns in vegetation on a regional and continental scale. At the same time, an increasing amount of geographically depicted environmental data can be freely acquired, offering new opportunities for spatially upscaling ecological-environmental research. This study on European Atlantic dune grasslands can be seen as an example. More in detail, we analysed the phytosociological variation of the class *Koelerio-Corynepherea* in relation to climatic and edaphic factors. Patterns in species composition in a vegetation dataset, comprising 1,466 relevés made along the entire European Atlantic coast (Iceland-Southern Spain), was analysed using ordination and clustering techniques. The observed patterns in the vegetation were overlaid with an environmental dataset, including climate variables and soil data. We observed a clear gradient within the *Koelerio-Corynepherea*, driven by climate as the major factor. The common idea that coastal vegetation is principally azonal, predominately defined by soil and distance to the sea, should be questioned, as this large-scale analysis of the European Atlantic dune grasslands is demonstrating.

Classification and ecology of vegetation: wetlands & mountains

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37 A PHYTOSOCIOLOGICAL STUDY ON MELENDIZ MOUNTAIN IN CENTRAL ANATOLIA (NİĞDE/TURKEY)

Nihal KENAR

Aksaray University, Faculty of Science & Letters Biology Department 68100, AKSARAY, Turkey

** e-mail: nkenar@aksaray.edu.tr*

It is commonly accepted that the mountain ecosystems have a key importance with regards to genetic sources and endemic species. The mountainous areas covering a great part of Turkey have also an important role in terms of plant diversity. The reason of rich biodiversity of mountainous areas in Anatolia is the altitudinal variation in the short horizontal distance, exposure, climatic changes in the last glacial period. Melendiz Mountain (2963m) which is located in the southern part of Central Anatolia is within the boundaries of Central Anatolian district of Irano-Turanian floristic region phytogeographically. The study area is under the influences of semi-arid very cold type of Mediterranean climate. The vegetation of the area was studied according to Braun-Blanquet approach and classified into 6 associations, 6 sub-associations. In addition, some statistical methods (Cluster Analysis & DCA) were used for the determination of associations and sub-associations to ensure accuracy and provide easiness. All the associations and sub-associations are new for science. It is thought that this study will be able to be helpful for determining the vegetation composition of the mountainous areas which have unique and special living conditions but are under the influence of human intensely, contributing the studies of vegetation classification, observing alteration of vegetation in the next years.

38 COASTAL CLIFFS AND SALT MARSHES IN NATURA 2000 SITES OF CRETE (GREECE) - DISTRIBUTION, CONSERVATION STATUS AND THREATS

Friedemann GORAL, Florian GOEDECKE, Parastoo MAHDAVI & Erwin BERGMEIER

University of Göttingen, Untere Karspüle 2, 37073 Göttingen, Germany

** e-mail: fgoral@uni-goettingen.de*

Rocky seashores and salt marshes are sensitive littoral habitats. Exposed to tidal wave, temporary inundation or sea spray, these habitats are varying from sparsely vegetated rocks, flats and depressions with few annual and perennial herbs near the shore line (1240, 1310) to the flat supralittoral expanses of tall grasses and halophilous shrubs (1410, 1420). We present results of the ongoing mapping and monitoring of the Natura 2000 sites in Crete. Distribution, conservation status and major threats are displayed. Vegetated rocky coasts were observed along the northwestern peninsulas, and on the small islands around Crete, moreover along much of the south and east coast. Salt meadow and salt marsh complexes occur in a few places on the coastal flats of Palaekastro and near Vai in the east, as well as near Falassarna in the northwest. A few other important salt marshes occur outside the Natura 2000 sites. The distribution of salt marshes and meadows is naturally fragmented and the extant patches are among the most threatened habitat types. While the present conservation status of most coastal rocks is favourable, it is extremely bad for salt marshes, salt meadows and related habitats. All salt marshes behind the shore line are under immediate pressure. Constructions even in the Natura 2000 sites destroyed significant parts of the vegetation complex. Although signposted as protected site, housebuilding, parking, camping etc. are uncontrolled even inside the remaining areas of saltmarsh vegetation. To serve the remaining sites, it is crucial to implement a strict separation of areas accessible to the tourists from others which are protected and impassable. Route guidance and signposted parking areas are essential. Area stewardship by NGOs or local authorities is probably indispensable. To date, in Crete no sustainable measures of protection have yet been undertaken in salt marshes in or outside the Natura 2000 network.

39 EUROPEAN GRAVEL BAR VEGETATION SURVEY

Veronika KALNÍKOVÁ, Milan CHYTRÝ, Data Contributors

Department of Botany and Zoology, Faculty of Science, Masaryk University, otlářská 2, CZ-61137, Czech Republic

* e-mail: v.kalnikova@seznam.cz

Gravel-bed rivers with unique gravel-bar habitat and typical vegetation are found across the whole of Europe. The gravel bars are typical feature of braided rivers and are common on streams in temperate piedmont and mountain-valley areas of young and easily eroding mountains. Nowadays, due to different interventions and consequent changes in river morpho- and hydrodynamics they belong to most endangered habitats. This is a report from an ongoing project which aims to collect and analyse phytosociological relevés from European national and regional databases. It is also based on vegetation data from the literature and own data collected in the field in countries where this vegetation has not been studied so far. We focus mainly on vegetation of the orders *Epilobietalia fleischeri*, *Andryaetalia ragusinae* and a group of alliances of willow scrub belonging to the class *Salicetea purpureae*, but we are interested in any possible vegetation types which can grow there, including vegetation of all successional stages. Gravel bar vegetation was described and classified with different approaches in various regions. However, there are some inconsistencies between these local or regional classifications and it is obvious that a synthesis is necessary. The new project of European Vegetation Archive (EVA) offers a great opportunity to use formalized classification and unify the previous concepts. It is also possible to improve knowledge about distribution of this rare vegetation, study different aspects of diversity of this habitat and focus on some ecological issues such as plant invasions. We present here a brief overview of about 5 000 relevés collected from 23 European countries.

40 CHASMOPHYTIC VEGETATION OF THE CRIMEAN MOUNTAINS (UKRAINE)

Yakiv P. DIDUKH

* e-mail: ya.didukh@gmail.com

The Crimean Mountains reaching the altitude of 1545 m above the sea level consist of various sedimentary and volcanic rocks on which the chasmophytic vegetation is formed providing a habitat for many endemic and rare endangered species. Basing on our detailed database, critical assessment results of surveyed plant communities, studies of literature sources, we have developed the new syntaxonomic system and respective biotope classification for the region. We have proposed the integration of *Cystopteridion* Richard 1972 alliance (ass. *Saxifraga irriguae-Arabidetum caucasicae* Ryff 2000) into the class *Asplenieta trichomanis* (Br.-Bl. 1934) Oberdorfer 1977, and *Asplenio-Parietalion judaicae* Korzhenevski et Klukin 1989 (ass. *Asplenio-Parietaetum serbicae* Korzhenevski et Klukin 1989) into the class *Cymbalario-Parietarietea diffusae* Oberdorfer 1967. Lichen plant communities on different rock outcrops are attributed to two different classes *Verrucarietea nigriscentis* Wirth 1980 (all. *Caloplacion decipientis* Klem 1950) and *Rhizocarpeta geographici* Wirth 1972 (*Parmelion conspersae* Hadač in Klika et Hadač 1944). The communities of the steep slopes and cliffs with unformed soils are attributed to the class *Sedo-Scleranthetea* Br.-Bl. 1955 (all. *Drabo cuspidatae-Campanulion tauricae* Ryff 2000, ass. *Veronico cymbalariae-Asplenietum* Ryff 2006, *Drabo cuspidatae-Potentillietum geoidis* Ryff 2000 and *Alysso obtusifolii-Arabidetum caucasicae* Ryff 2006)). In the waterfalls we have found the elements of *Adiantetea* Br.-Bl. et al. 1952 plant communities (*Adiantion* Br.-Bl. et Horvatic 1934 ass. *Eucladio-Adiantetum capilli-veneris* Br.-Bl. ex Horvatic 1934).

41 VARIABILITY, DISTRIBUTION AND SPECIES COMPOSITION OF SILICEOUS ALPINE GRASSLANDS IN EUROPE

Jozef ŠIBÍK, Borja JIMÉNEZ-ALFARO, Mihai PUȘCAȘ, Vladimir KRICSFALUSY, Jean-Paul THEURILLAT, Xavier FONT, Philippe CHOLER, Zuzana DÚBRAVCOVÁ and EVA Database Partners

Institute of Botany SAS, Dubravska cesta 9, Bratislava, Slovakia

Masaryk University, Kotlarska 2, Brno, Czech Republic

* e-mail: jozef.sibik@savba.sk, borja@sci.muni.cz

Siliceous alpine grasslands of the class *Juncetea trifidi* (syn. *Caricetea curvulae*) represent climax communities on silicate bedrock or on the nutrient-poor de-calcified soils of European mountains. Vegetation is mainly species-poor, formed by xero- to mesophilous, heliophilous and acidophilous graminoids (grasses, sedges and rushes) with significant presence of foliose and fruticose lichens. Regarding species composition, it has been recognized the overlapping with neighboring communities that interact with these grasslands, mainly from the classes *Carici rupestris-Kobresietea*, *Salicete herbacea*, *Loiseleuro-Vaccinietea* and *Mulgedio-Aconitetea*. This was a reason why many of these syngenetically related communities were classified within one broadly defined class in the past. Dominant role of grasses reflecting different ecology, functional types as well as structure determine the main differences against other vegetation types, which usually create mosaic pattern in the alpine belt. We focused on the variation in species composition of high-altitude siliceous grasslands and the delimitation of syntaxa at the level of alliance. These units were characterized by environmental conditions (e.g. climate) and by the occurrence of biogeographically-relevant taxa. Data compilation was focused on national, regional and personal databases covering alpine vegetation in Europe. National and regional databases were accessed through the infrastructure of the EVA. For the selection of data, we generated a list of characteristic species (i.e. those that repeatedly occur in the target habitat) based on the description of the phytosociological alliances that belong to *Juncetea trifidi*. Complementary, those species that occur in the target vegetation but are also frequent in other alpine habitats were excluded. At the end, we selected a total of 56 characteristic species which are expected to be at least partially represented in most of the acidic alpine grasslands of the European mountains. On the basis of a semi-supervised procedure, a maximum number of 15 clusters with a starting point of 9 clusters representing the known alliances were set up. These clusters were identified as alliances belonging to the class *Juncetea trifidi* or to the related alliances represented different vegetation types. Revised syntaxa has been characterized by diagnostic, constant and dominant species. Their geographical distribution, climatic and ecological characteristics are provided.

42 IS PHYTOSOCIOLOGICAL TYPOLOGY CONSISTENT WITH TYPOLOGIES BASED ON MANAGEMENT, TOPOGRAPHY AND SOIL PROPERTIES? AN EXAMPLE FROM SEMI-NATURAL MESIC GRASSLANDS OF THE UKRAINIAN CARPATHIANS

Monika JANIŠOVÁ, Liubov BORSUKEVYCH, Katarína HEGEDÜŠOVÁ , Roman KISH, Vladimír PÍŠ, Janka SMATANOVÁ, Iveta ŠKODOVÁ

Institute of Botany, Slovak Academy of Sciences, Dumbierska 1, Banská Bystrica, SK 974 11, Slovakia

* e-mail: monika.janisova@gmail.com

Floristic composition is often chosen as a basis for the classification of terrestrial communities because it reflects the ecological processes acting on a site more measurably than any other factor or set of factors. In our contribution, we compare a typology of semi-natural mesic grasslands based on floristic composition with typologies, which are based on a set of topographical, pedological and management data. The main question is whether these typologies are analogous (indicating consistent patterns) or complementary (each providing specific additional information). A set of phytosociological relevés from mesic grasslands was recorded in the Ukrainian Carpathians supported by detailed information on topographical (location, altitude, slope, solar radiation), pedological (pH, soil depth, soil content of phosphorus, potassium, magnesium, nitrogen and humus), and management (information on mowing, plowing, burning, trampling and grazing intensity) data. Each set of phytosociological and ecological data was analyzed by non-metric multidimensional scaling or principal component analysis and the resulting ordination plots were compared. Based on floristic composition and expert knowledge, four plant communities were distinguished ordered to the following alliances (associations): *Arrhenatherion elatioris* (*Poo-Trisetetum*), *Cynosurion cristati* (*Lolio-Cynosuretum*), *Violion caninae* (*Campanulo rotundifoliae-Dianthetum deltoidis*) and *Nardo strictae-Agrostion tenuis*. The typology based on all measured ecological variables was consistent with the typology based on floristic composition. Each specific subset of ecological variables provided valuable additional information complementary to the information obtained by phytosociological sampling. Classification of semi-natural grasslands based on habitat conditions and management provided reasonable results compatible with the phytosociological classification at the level of alliances. Financial support was provided by Scientific Grant Agency of the Slovak Republic (VEGA 2/0027/15).

43 CONTINUITY RESTORATION OF GREEN & BLUE WAYS IN COASTAL RIVERS: A DANGER FOR LONG-TERM ESTABLISHED COMMUNITIES IN LENTIC ECOSYSTEMS AND LATERAL CONNECTIONS OF BROOKS?

Ivan BERNEZ & Didier LE COEUR

** e-mail: bernez@agrocampus-ouest.fr*

Since the 70's, rivers survey authorities have gradually integrate biological knowledge and ecological concepts in their way of managing aquatic ecosystems, abandoning the systematic pure physical civil engineering actions. In order to avoid environmental risk, the empirical works, usually (but not always) done with an amount of experience, an excellent local knowledge of the ecosystems and much good sense, have incorporate more and more ecological concepts. As ecologists, we should only be happy. The river managers have now integrated the huge and rapid progresses in landscape ecology sciences, and the blue & green ways connectivity is now justifying river "restoration" programs in order to respond to the good ecological statute of rivers before 2015 in the European water frame work directives. The risk of such rapid (due to the imposed dead-lines) integrations of new scientific concepts is almost not discussed in front of the state of the "disconnected" river landscapes, as for example by old water-mills wears, that are supposed to be a danger for fish biodiversity. We propose to confront the benefits for migratory fishes with some other ecological views, in lentic, swamps, and lateral connections of brooks, near-by such historical human activities. Our observations are based on vegetation survey (known to support animal biodiversity) and the singularity of this vegetation in their landscape since centuries. We also discuss the risk to return to useless and costly important civil engineering actions (as before the 70's), that could impact definitively interesting ecological communities linked with the ecosystems due to the presence of these old water-mills.

Classification and ecology of vegetation: forests and heathlands

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44 THE FRENCH MONITORING OF FOREST HABITATS

Fabienne BENEST

IGN, Caupian - Rue Pierre Ramond, 33166 SAINT MEDARD EN JALLES CEDEX, France

** e-mail: fabienne.benest@ign.fr*

The French monitoring of forest habitats is based on a simple idea: using the national forest assessment (process) focused on timber production to provide new informations about natural habitats conservation status. A national typology occurred and, to date, it is 7800 points that were characterized by their type of potential habitat, at the elementary habitat level. The data provide new informations about forest habitats (about geographical breakdown, about frequency). The deployment of the project will be effective on the whole territory in 2017 to produce indicators of structure and function for reporting 2018.

Keywords: monitoring, conservation status, forest habitats.

45 FORMALIZED CLASSIFICATION OF FOREST VEGETATION IN SOUTHERN TAIWAN: IS THERE A CLEAR BOUNDARY BETWEEN TROPICAL AND SUBTROPICAL COMMUNITIES?

Yi-Shin CHIAN, Ching-Feng LI, David ZELENÝ, Chih-Chiang WANG, Ching-Long YEHP

Department of Botany and Zoology, Masaryk University, Kotlarska 2, Brno, Czech Republic

** e-mail: r902771@gmail.com*

The boundary between Holarctic and Paleotropic floristic kingdom occurs in southern Taiwan, East Asia, at latitude around 22°N. Empirically, the Holarctic flora is the main element of subtropical forest in the whole of Taiwan, while the Paleotropic flora forms the tropical forest only in southern part of Taiwan. However, there is a lack of studies about the clear definition of tropical and subtropical forests at association level and possible explanations for their distributional pattern. The aim of this study is to classify forest vegetation at this biogeographical boundary in southern Taiwan, using formalized phytosociological approach. The dataset of 727 relevés used for this study was partly collected by intensive field survey and partly compiled from the National Vegetation Database of Taiwan (AS-TW-001). This dataset covers the distributional range of subtropical and tropical forests at different temperature and moisture conditions in latitudes between 22°19'N and 22°57'N and at altitudes between 95 m and 3038 m a.s.l. It contains 1353 species of vascular plants including trees, shrubs, herbs, epiphytes and lianas, and also 17 environmental factors including information about temperature, moisture and topography of each relevé. Each association was defined by unequivocal assignment rule using Cocktail Determination Key. The nomenclature of syntaxa follows the third edition of International Code of Phytosociological Nomenclature. Main questions we aim to answer by this phytosociological study are whether there is a clear spatial boundary between tropical and subtropical forests in southern Taiwan, how is this boundary reflected by changes in forest species composition at the association level and which environmental factors offer the most probable explanation for it.

46 EXAMINATION OF OLD SESSILE OAK STAND WITH 3D ACOUSTIC TOMOGRAPHY

Petra TRENYIK, Orsolya SZIRMAI, Attila BARCZI, Szilárd CZÓBEL

Szent István University, 1 Páter Károly Street, H-2100 Gödöllő, Hungary

** e-mail: trenyikpetra@gmail.com*

Sessile oak is widespread in Europe, it is some 160,000 hectares the main forest forming species in Hungary. The extent can increase in the future, because it has not only appropriate production site but also it has multilateral utilization so sessile oak is one of the most popular tree species among foresters. However according to some prognoses 82-100 percent of the zonal spread of the sessile oak will be outside the pale of the optimal climate in the Carpathian Basin in 2050. This paradox make essential the examination of the stress tolerant and health status of the sessile oak stands particularly, so that we can step into the necessary information to detect changes.

In the present study, in addition to the general field of visual control instrumental measurements were carried out with the help of FAKOPP 3D Acoustic Tomography in the natural sessile oak stand of the Botanical Garden of Szent István University. The FAKOPP was developed for testing live trees, the instrumental crawls the inside status and the rate of the rot of the bole. The measuring principle is that the healthy wood tissue conducts sound better than the rotten wood. During this study 16 randomly selected 100 years old sessile oak specimens were measured. The health status examination was performed on every selected bole in 5 different heights. If the classification of the health status has been measured according to the widespread visual methodology without instrument, the stands would be found in good health. On the examined trees visually was not observed trace of disease mostly. Nevertheless, it has been found in the performance of the investigation that the stand is fairly poor condition. Rot was detected with the instrumental from each of the 16 examined specimens. During the examination the degree of depravity was the highest (29,75%) at the first measured layer (40 cm above the ground level), and decreased steadily towards the higher layers. Upon completion of the examination, it was concluded that the poor health status of the stand is not due to the diseases and pests. The stand is not core, but sprout origin, this is probably the reason for the high degree of the rot of the bole. It appears that the rot comes from the roots, whose rot is the sign of the natural aging. The sessile oak belongs in the longer-lived tree species, living about 200 years. It looks, that the roots life is coming to the end, and in addition to rot of the old trunk increases the risk of rot in the bole.

47 HABITAT DIVERSITY OF BEECH FORESTS IN THE WESTERN BALKAN

Kalina PACHEDJIEVA, Nadezhda GEORGIEVA, Mariyana LYUBENOVA

Sofia University - Faculty of Biology, Dep. of Ecology and EP, 1164 BG-Sofia, 8 Dragan Tzankov Blvd, Sofia, Bulgaria

* e-mail: kalina.pachedjieva@gmail.com

The object of the present study are beech forest communities in a Nature 2000 site in the Western Balkan range where these forests have great distribution and show variety in ecological, classification and habitat diversity. In this respectively small territory beech communities are an essential part of the vegetation cover as in the whole European continent. Dominant species *Fagus sylvatica* is represented by its subspecies *F. sylvatica* ssp. *sylvatica* and *F. sylvatica* ssp. *moesiaca*, the latter forming the south Balkan populations or those from the lower altitudes. The study reveals classification and habitat affiliation of the beech communities in the investigated region. For achieving this purpose classical methods for phytosociological analysis were applied. A cluster analysis of 36 was performed for clarifying the classification affiliation of the beech stands – these are the widely distributed alliances *Luzulo-Fagion sylvaticae*, *Asperulo-Fagion sylvaticae* and the more thermophilous *Cephalanthero-Fagion sylvaticae*. Moesian beech forests take warmer and humid stands from the lower altitudes. They divide into two groups – the more thermophilous communities show affiliation to *Cephalanthero-Fagion*, and the other showing more mesophilous species composition on silicate stands belong to *Asperulo-Fagion*. Affiliation to lower syntaxonomical rank is also discussed. The rock base and soil type are different. Habitats are defined according to the EUNIS classification system. A map of habitat diversity is made. An ecological special analysis is performed on the basis of habitat distribution and GIS data for elevation, exposition, slope, bedrock and soil types. In this study we support the thesis discussed in the relevant literature that the classification criteria of beech forests are local topographic and climatic differences and not geographical distribution. The map of beech habitats and the special analysis of their distribution confirm and illustrate this regularity. That should be the main practical contribution of the study. The relevés for the research were made within the project of the Ministry of environment and waters “Mapping and determination of the conservation status of natural habitats and species – phase I”.

48 A PHYTOSOCIOLOGICAL ANALYSIS OF THE *QUERCUS COCCIFERA* L. STANDS IN SOUTH ALBANIA (NE MEDITERRANEAN)

Nenad JASPRICA, Željko ŠKVORC & Milenko MILOVIĆ

Institute for Marine and Coastal Research, University of Dubrovnik, Kneza Damjana Jude 12, P.O. Box 83, HR-20000 Dubrovnik, Croatia

** e-mail: nenad.jasprica@unidu.hr*

The results of a phytosociological investigation of the *Quercus coccifera* L. stands occurring along the Adriatic and Ionian coasts in south Albania are given. The surveyed stands are localized in the Thermo-Mediterranean and Meso-Mediterranean belts. On the basis of literature and unpublished data, *Q. coccifera* stands extend from the shoreline up to 680 m of altitude, within the *Quercetea ilicis* vegetation zone. According to numerical analysis, south Albanian *Q. coccifera* stands can be divided into two broad groups forming macchia of 4 m height and low shrublands (0.6-1.2 m) defined primarily by degree of human pressure. The highly anthropogenic distribution and composition of *Q. coccifera* shrublands within the study area does not permit the provision of a precise syntaxonomical reference in terms of association. According to the results, human-induced degradation can cause differentiations in *Q. coccifera* shrublands allowing some elements of the neighbouring flora to participate in, and often alter, both the physiognomy and the floristic composition of the shrublands. In addition, relevés from *Q. coccifera* Albanian stands were differentiated from Croatian and Montenegrin the *Fraxino orni-Quercetum cocciferae* associations. Conversely, there were no differences in the biological and ecological spectra between the eastern Adriatic and south Albanian stands. Hemicryptophytes prevailed and the chorological spectrum highlights a clear dominance of the steno-Mediterraneans. With respect to indicator values, an important differentiation from the eastern Adriatic associations was shown only in higher light intensity of the Albanian stands. The results of the study should be read and analysed in the context of the anthropogenic influences that are occurring as a generalized phenomenon throughout the Mediterranean basin.

49 DIVERSITY AND STRUCTURE OF HIGHLAND TAIGA BELT SPRING FEN VEGETATION IN THE SOUTHERN URAL

Tatiana IVCHENKO, Viktor DENISENKOV

Komarov Botanical Institute of the Russian Academy of Sciences (BIN RAS), Professor Popov Street, Building 2, Saint Petersburg, Russia

* e-mail: ivchenkotat@mail.ru

Problem. The region of Southern Ural is characterized with borders of vegetation provinces both on regional and subcontinental range. This causes transitional nature of the vegetation of the region investigate. Minerotrophic spring fens are forming around outflows of spring water. They are characterized with high plant species diversity and abundance of rare species redlisted in Russia both on federal and regional level. The goal of our research was to establish the community diversity and ecological structure of spring fen vegetation in highland belt of coniferous forests of the Southern Ural.

Materials and methods. Totally we investigated 13 mire massifs all across Chelyabinsk oblast. Totally 150 vegetation 100 m² relevés were made. 12 peat cores were sampled, 160 samples of peat deposits were analyzed. Distribution of mire vegetation was evaluated using satellite images from Google Earth. Statistical analysis including NMS ordination and cluster analysis was performed using PC-ORD 6.0 program package. To evaluate ecological gradients we used environmental values by H. Ellenberg, E. Landolt, L. Ramenskiy and D. Tsyganov.

Results. Ordination shows two significant gradients. The first one explains 76.5% of total variance. It correlates with environmental values of soil reaction, temperature and soil mineral richness. This gradient is most likely shows the influence of spring water. Spring water indeed has both chemical and temperature influence since it is cold and saturated with mineral substances. The second gradient explains only 12,6% of total variance and correlates with environmental values of soil moisture. Likely it is provided by gradient between fen center and margin. Mires forming close to springs are normally situated near the slope foots and surrounded with fir and spruce forests mixed with birch. They are characterized with small size (<500 m in diameter normally) that makes them difficult to find on satellite images. Margins of such massifs are occupied with *Picea obovata*-*Carex juncella* and *Picea obovata*-*Carex loliacea*-*Rubus chamaemorus*-*Sphagnum warnstorffii* communities. *Saxifraga hirculus*-*Carex diandra*-*Palustriella commutata*-*Campylium stellatum*, *Carex diandra*-*Sphagnum warnstorffii*-*Campylium stellatum*, *Carex rostrata*-*C. diandra*-*Sphagnum warnstorffii* communities are forming the special and ecological sequence in the central part of mire massif near the spring. Hummocks with oligo- and mesotrophic communities (*Carex lasiocarpa*-*Vaccinium uliginosum*)...

50 MAINTENANCE OF FAVOURABLE CONSERVATION STATUS OF EUROPEAN UNION IMPORTANCE HABITATS IN FORESTS OF LATVIA WITHIN LANDS MANAGED BY THE LATVIA'S STATE FOREST

Ieva ROVE

The Joint-Stock Company "LATVIJAS VALSTS MEŽI", Vainodes Street 1, Riga, Latvia

** e-mail: I.Rove@lvm.lv*

With 3.8 million ha of forests or 56.9% of the territory, Latvia is among the most forested countries in Europe. The highest amount and diversity of nature values in Latvia occur in the State forest managed lands. The Joint-Stock Company "Latvijas valsts meži" (in further text - LVM), established in 1999, manages over a half of Latvia's forests. LVM manages state-owned forests and aims to ensure sustainable stewardship of these forests. Integrated management considering nature conservation and maintenance of biological diversity takes important place within strategic and tactical planning of lands managed by the LVM. Functional management of forests covers various aspects, the basis of longterm sustainable development is to balance interests of nature conservation and economics. Since 2010, great attention has been dedicated to implement these aims: - registration of rare and endangered species, and monitoring of habitats of these species, has been initiated; - new, on Latvia's State Forests scale, protected areas with importance for biological diversity, so called Ecoforests, has been established where, besides nature protection measures binding on the State level, additional measures to maintain rare species and habitats has been adapted. Development and management of the Ecoforests are one of the first steps in the Baltic region to implement the EU importance species and habitat conservation outside the Natura2000 network, and develop basis for further green infrastructure and connectivity. Existing data on the State Forests managed lands (1.62 million ha of forests, 220 000 ha other lands), shows quite high diversity of the European Union importance habitats. The main management measure - wilderness approach, has been implemented in the terrestrial Natura2000 network, micro-reserves, EU importance habitats. Special management activities have been carried out according to certain scientifically based situation assessment. Specific nature values will require special management measures, such as either non-intervention or active management, which in turn may consists on maintenance, improvement or restoration. Surveillance and monitoring of species and the EU importance habitats, since 2012, is done according to the monitoring programme and in line with methodology of Natura2000 monitoring programme of the State. The voluntary initiative for nature conservation of the LVM, additional to the existing legal requirements, represents a step towards implementation of green infrastructure and improving connectivity of terrestrial Natura2000 network.

51 “DARK NEEDLE CONIFER” DECLINE AND MORTALITY IN SIBERIA

V. I. KHARUK, S. T. IM, I. A. PETROV

Head, Forest monitoring Lab, Sukachev Forest Institute, Akademgorodok 50-28, Krasnoyarsk, Russia

* e-mail: kharuk@ksc.krasn.ru

Spatial and temporal patterns and causes of “dark needle conifers” [DNC: Siberian pine (*Pinus sibirica*), fir (*Abies sibirica*), and spruce (*Picea obovata*)] decline and mortality in south of Mid Siberia. Analysis was based on satellite (Landsat, Aqua/MODIS, GRACE) data, dendrochronological measurements, and climate variables (air temperature, precipitation, vapor pressure deficit, and drought index SPEI). Tree mortality began on shaped south facing hilltops shifting with time to lower elevations with gentle slopes. Maximum mortality was within relief features with a high water stress risk, i.e., steep (15°–25°) south facing slopes and convex terrains. An analysis of dendrochronological, meteorological and gravimetric (GRACE) data showed that Siberian pine and fir mortality occurred after consecutive droughts. Tree ring widths positively correlated with relative humidity and negatively with a SPEI, vapor pressure deficit, and occurrence of late frosts. The area of dead stands correlated with drought severity. The uphill mortality boundary limited by elevation gradient of precipitation. A significant impact of previous year growth conditions on the current ring width was found. That effect was attributed to drought-induced trees sensitization to bark beetles and fungi impact. Regeneration survived drought and showed a growth release while the upper canopy declined. Results obtained showed a primary role of water stress in Siberian pine and fir mortality with a secondary role of biotic impact. At geographical scale fir and Siberian pine mortality were observed within southern parts of its areal. Mortality began on the margins DNC-dominated stands within forest-steppe or conifer-broadleaf ecotones. If model projections of increased aridity are correct DNC within the southern part of its areal will be replaced by drought-resistant species (e.g., *Pinus silvestris*, *Larix sibirica*). The observed Siberian pine and fir mortality is part of a broader phenomenon of DNC decline and mortality in European Russia, Belarus, Siberia, and the Russian Far East, as well as conifer mortality in Europe and North America. This research supported by Russian Science Fund grant No.14-24-00112.

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List of participants

Surname	Institution	Country	Mail
Agrillo	University Of Roma "La Sapienza	Italy	emiliano.agrillo@uniroma1.it
Aidoud	CNRS	France	ahmed.aidoud@univ-rennes1.fr
Alard	University Of Bordeaux	France	didier.alard@u-bordeaux.fr
Alignier	INRA	France	audrey.alignier@rennes.inra.fr
Alquini	University Of Pisa	Italy	alquini@gmail.com
Amina	Université Batna	Algeria	aminab1990@hotmail.com
Angelini	La Sapienza Università Di Roma	Italy	pierangela.angelini@uniroma1.it
Argagnon	Conservatoire Botanique National Méditerranéen	France	o.argagnon@cbnmed.fr
Arvor	CNRS UMR LETG	France	damien.arvor@uhb.fr
Aunina	University Of Latvia	Latvia	lsalmina@latnet.lv
Auriere	IMBE IUT Avignon	France	anne.auriere@alumni.univ-avignon.fr
Beck	Serbal	France	serbal@laposte.net
Belonovskaya	Institute Of Geography	Russia	belena53@mail.ru
Benest	IGN	France	fabienne.benest@ign.fr
Benoît	Independant	France	lucie.benoit1@gmail.com
Benot	Univ. Bordeaux	France	marie-lise.benot@u-bordeaux.fr
Bernard	Univege - Blaise Pascal University	France	charles_etienne.bernard@univ-bpclermont.fr
Bernez	Agrocampus Ouest - INRA	France	bernez@agrocampus-ouest.fr
Bioret	Brest University	France	frederic.bioret@univ-brest.fr
Bonis	CNRS	France	anne.bonis@univ-rennes1.fr
Botta-Dukát	MTA Centre For Ecological Research	Hungary	botta-dukat.zoltan@okologia.mta.hu
Boullet	Nesogenes	France	v.boullet43@orange.fr
Bouzille	Rennes 1 University	France	jan-bernard.bouzille@univ-rennes1.fr
Box	University Of Georgia	United States	boxeo@uga.edu
Capelo	National Institute Of Agrarian And Vet. Research	Portugal	jorge.capelo@gmail.com
Carni	ZRC Sazu	Slovenia	carni@zrc-sazu.si
Carre	UICN France	France	aurelien.carre@uicn.fr
Casella	Isprambiente	Italy	laura.casella@isprambiente.it
Chian	Masaryk University	Czech Republic	r902771@gmail.com
Chytrý	Masaryk University	Czech Republic	chytry@sci.muni.cz
Ciccarelli	University Of Pisa - Department Of Biology	Italy	daniela.ciccarelli@unipi.it
Clement	Rennes 1 University	France	bemiclement@gmail.com
Colasse	Conservatoire Botanique National De Brest	France	v.colasse@cbnbrest.com
Cuk	University Of Novi Sad	Serbia	mirjana.cuk@dbe.uns.ac.rs
De Bie	Research Institute For Nature And Forest	Belgium	els.debie@inbo.be
De Ronde	Central Government Real Estate Agency	The Netherlands	iris.deronde@wur.nl
De Sanctis	Sapienza University Of Rome	Italy	michedes@gmail.com
Deák	University Of Szeged	Hungary	aron@geo.u-szeged.hu
Del Vecchio	Ca' Foscari University	Italy	silvia.delvecchio@unive.it
Delassus	Conservatoire Botanique National De Brest	France	l.delassus@cbnbrest.com

List of participants

Surname	Institution	Country	Mail
Delbosc	Université De Bretagne Occidentale	France	pauline.delbosc@univ-brest.fr
Delcoigne	Univege - Blaise Pascal University	France	arnaud.delcoigne@univ-bpclermont.fr
Demartini	Institut De Geoarchitecture	France	charlotte.demartini@univ-brest.fr
Demina	Karachay-Circassian State University	Russia	ondemina@yandex.ru
Dengler	University Of Bayreuth	Germany	juergen.dengler@uni-bayreuth.de
Dimopoulos	University Of Patras	Greece	pdimopoulos@upatras.gr
Dubyna	National Academy Of Sciences Of Ukraine	Ukraine	geobot@ukr.net
Dufour	Rennes 2 University	France	simon.dufour@univ-rennes2.fr
Dziuba	National Academy Of Sciences Of Ukraine	Ukraine	geobot@ukr.net
Egorov	St. Petersburg State University	Russia	egorovfta@yandex.ru
Endrédi	Szent István University	Hungary	anett.endredi@gmail.com
Evans	European Topic Centre On Biological Diversity	France	evans@mnhn.fr
Forker	Htw Dresden	Germany	forker@htw-dresden.de
Fujiwara	Yokohama City University	Japan	kazue@ynu.ac.jp
Gaudillat	National Museum Of Natural History	France	gaudillat@mnhn.fr
Gavilán	Universidad Complutense	Spain	rgavilan@ucm.es
Gillard	Université De Rennes 1	France	morgane.gillard@univ-rennes1.fr
Giusso Del Galdo	University Of Catania	Italy	g.giusso@unict.it
Glemarec	Conservatoire Botanique National De Brest	France	e.glemarec@cbnbrest.com
Goedecke	Georg-August University Goettingen	Germany	fgoedec@gwdg.de
Goral	University Of Göttingen	Germany	friedemann.goral@uni-goettingen.de
Goret	Conservatoire Botanique National De Brest	France	m.goret@cbnbrest.com
Guillon	Conservatoire Botanique National De Brest	France	h.guillon@cbnbrest.com
Hardegen	Conservatoire Botanique National De Brest	France	m.hardegen@cbnbrest.com
Haveman	Central Government Real Estate Agency	The Netherlands	rense.haveman@wur.nl
Hennekens	Alterra	The Netherlands	stephan.hennekens@wur.nl
Hubert-Moy	Rennes 2 University	France	laurence.hubert@uhb.fr
Iakushenko	University Of Zielona Góra	Poland	d.iakushenko@wnb.uz.zgora.pl
Iemelianova	Kholodny Institute Of Botany Nas Of Ukraine	Ukraine	geobot@ukr.net
Isermann	Bremen University	Germany	maike.isermann@uni-bremen.de
Ivchenko	Institute Of The Russian Academy Of Sciences	Russia	ivchenkotat@mail.ru
Jagaille	Agrocampus Ouest	France	marie.jagaille@agrocampus-ouest.fr
Jandt	Martin-Luther-University Halle-Wittenberg;	Germany	ute.jandt@botanik.uni-halle.de
Janisova	Institute Of Botany, Slovak Academy Of Sciences	Slovakia	monika.janisova@gmail.com
Jasprica	University Of Dubrovnik	Croatia	nenad.jasprica@unidu.hr
Jiménez-Alfaro	Masaryk University	Czech Republic	borja@sci.muni.cz
Jung	Université Rennes	France	vincent.jung@univ-rennes1.fr
Kadetov	Lomonosov Moscow State University	Russia	biogeonk@mail.ru
Kalníková	Masaryk University	Czech Republic	v.kalnikova@seznam.cz
Kamiński	Nicolaus Copernicus University	Poland	daro@umk.pl
Karadimou	University Of Patras	Greece	elkaradi@gmail.com
Kenar	Aksaray University	Turkey	nkenar@aksaray.edu.tr
Kharuk	Sukachev Forest Institute	Russia	kharuk@ksc.krasn.ru
Khaznadar	Université Ferhat Abbas Sétif 1	Algeria	mounakhaznadar@gmail.com

Surname	Institution	Country	Mail
Lalanne	French Ministry Of Ecology	France	arnault.lalanne@developpement-durable.gouv.fr
Lalslier	Université Rennes 2	France	marianne.lalslier@uhb.fr
Landucci	Masaryk University	Czech Republic	flavia.landucci@gmail.com
Laurent	Conservatoire Botanique National De Brest	France	e.laurent@cbnbrest.com
Le Roux	IRSTEA	France	marie.le-roux@irstea.fr
Lebouvier	CNRS	France	marc.lebouvier@univ-rennes1.fr
Leroyer	CNRS Archéosciences	France	chantal.leroyer@univ-rennes1.fr
Levointurier-Vadja	CNRS	France	cloe.levointurier-vajda@univ-rennes1.fr
Li	Masaryk University	Czech Republic	chingfeng.li@gmail.com
Louvel-Glaser	Muséum National d'Histoire Naturelle	France	jlouvel@mnhn.fr
Lysenko	Institute Of Ecology Of The Volga River Basin	Russia	ltm2000@mail.ru
Magnanon	Conservatoire Botanique National De Brest	France	s.magnanon@cbnbrest.com
Mahdavi	University Of Göttingen	Germany	pmahdavi@uni-goettingen.de
Marcenò	Masaryk University	Czech Republic	marcenocorrado@libero.it
Maréchal	IRSTEA	France	denis.marechal@irstea.fr
Matteodo	Université De Lausanne	Switzerland	magali.matteodo@unil.ch
Mekaoussi	University Hadj Lakhdar-Batna	Algeria	moufidamekaoussi@gmail.com
Monteiro-Henriques	CEF-ISA-UL	Portugal	tmh@isa.ulisboa.pt
Nagy	Szent István University	Hungary	nagyjano@yahoo.com
Naqinezhad	University Of Mazandaran	Iran	anaqinezhad@gmail.com
Neshaataeva	Institute Russian Academy Of Sciences	Russia	vneshataeva@yandex.ru
Neshataev	Institute Russian Academy Of Sciences	Russia	vn1872@yandex.ru
Noroozi	University Of Tabriz	Iran	noroozi.jalil@gmail.com
Oszwald	Rennes 2 University	France	johan.oszwald@univ-rennes2.fr
Özdeniz	Ankara University	Turkey	eozeniz@science.ankara.edu.tr
Pachedjieva	Sofia University	Bulgaria	kalina.pachedjieva@gmail.com
Palpurina	Masaryk University	Czech Republic	salza.palpurina@gmail.com
Panitsa	University Of Patras	Greece	mpanitsa@upatras.gr
Polyakova	Central Siberian Botanical Garden	Russia	galatella@mail.ru
Provoost	Research Institute For Nature And Forest	Belgium	sam.provoost@inbo.be
Rapinel	CNRS	France	sebastien.rapinel@univ-rennes1.fr
Rasomavicius	Nature Research Centre	Lithuania	valerijus.rasomavicius@botanika.lt
Rodwell	Independent Ecologist	United Kingdom	johnrodwell@tiscali.co.uk
Rosignol	CNRS	France	nicolas.rossignol@univ-rennes1.fr
Roux	Univege - Blaise Pascal University	France	camille.roux@clermont-universite.fr
Rove	Latvijas Valsts Meži	Latvia	i.rove@lvm.lv
Said	University Of Batna	Algeria	eco-fritas@hotmail.com
Sauzeau	Université De Bordeaux	France	beatrice.sauzeau@u-bordeaux.fr
Schaminée	Alterra WUR	The Netherlands	joop.schaminée@wur.nl
Schwabe-Kratochwil	Technische Universitaet Darmstadt	Germany	schwabe@bio.tu-darmstadt.de
Sekerciler	Ankara University Institute Of Science	Turkey	fatos_sekerciler87@hotmail.com
Sellin	Conservatoire Botanique National De Brest	France	v.sellin@cbnbrest.com
Sibik	Institute Of Botany Sas	Slovakia	jozef.sibik@savba.sk

List of participants

Surname	Institution	Country	Mail
Silc	Institute Of Biology Zrc Sazu	Slovenia	urban@zrc-sazu.si
Singh	Xterraedze	India	xterraedze@hotmail.com
Sobolev	Russian Academy Of Sciences	Russia	sobolev_nikolas@mail.ru
Spada	Dipartimento Di Biologia Ambientale	Italy	francesco.spada@uniroma1.it
Teillac-Deschamps	UICN France	France	pauline.teillac-deschamps@uicn.fr
Thébaud	Université Blaise Pascal	France	gilles.thebaud@clermont-universite.fr
Thiebaut	University Rennes 1	France	gabrielle.thiebaut@univ-rennes1.fr
Thierion	IRSTEA	France	vincent.thierion@irstea.fr
Thomas	Dresden University Of Technology	Germany	siegmar.thomas@mailbox.tu-dresden.de
Thomassin	Conservatoire Botanique National De Brest	France	g.thomassin@cbnbrest.com
Thouvenot	Université Rennes	France	lise.thouvenot@univ-rennes1.fr
Tölgyesi	University Of Szeged	Hungary	festuca7@yahoo.com
Tolnai	Szent István University	Hungary	martontolnai.geo@gmail.com
Trenyik	Szent István University	Hungary	trenyikpetra@gmail.com
Tzonev	Sofia University	Bulgaria	rossentzonev@abv.bg
Uogintas	Nature Research Centre	Lithuania	domas.uogintas@botanika.lt
Uzunov	Chlora Sas	Italy	uzunovd@gmail.com
Vannier	LECA GRENOBLE - LETG RENNES - CNRS	France	vannier.clemence@gmail.com
Viciani	University Of Florence	Italy	daniele.viciani@unifi.it
Vilches De La Serna	Universidad Complutense De Madrid	Spain	bvilches@ucm.es
Willner	VINCA	Austria	wolfgang.willner@vinca.at
Zeleny	Masaryk University	Czech Republic	zeleny.david@gmail.com
Zibzeev	Central Siberian Botanical Garden	Russia	egzibzeev@gmail.com



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