Geophysical Research Abstracts
Vol. 13, EGU2011-14027, 2011
EGU General Assembly 2011

Determinants of plant community composition of remnant biancane badlands: a hierarchical approach to quantify species-environment relationships

Simona Maccherini (1), Michela Marignani (2), Margherita Gioria (3), Monia Renzi (4), Elisa Santi (1), Dino Torri (6), Jonas Tundo (7), and Olivier Honnay (7)

(1) BIOCONNET, Biodiversity and Conservation Network, Department of Environmental Science "G.Sarfatti", University of Siena, Via P.A. Mattioli 4, 53100 Siena, Italy (maccherini@unisi.it/ fax: +39-0577232896,), (2) Department of Plant Biology, "Sapienza" University of Rome, Piazzale Aldo Moro 5 00185 Rome, Italy, (3) School of Agriculture, Food Science and Veterinary Medicine, University College Dublin, Belfield, Dublin 4, Ireland, (4) Research Centre for lagoonecology, fisheries and acquaculture, University of Siena, Polo Universitario Grossetano, via Lungolago dei Pescatori, 58015 Orbetello, Italy, (5) IASMA Research and Innovation Centre, Fondazione Edmund Mach, Environment and Natural Resources Area, Via E. Mach 1, 38010 S. Michele all'Adige, TN, Italy, (6) IRPI-CNR, Via Madonna Alta 126, 06128 Perugia, Italy, (7) Laboratory of Plant Ecology, Biology Department, University of Leuven, Arenbergpark 31, B-3001 Heverlee, Belgium

Within the agricultural landscape, biancanebadlands in Italy may support uncommon species and communities of high conservation value. In this study, we aimed to identify the environmental variables and processes that are most important in determining patterns in the vegetation of biancanebadlands. Since the species-environment relationships are known to vary with scale of observation and because of the high heterogeneity of biancane landscapes, we used a range of environmental predictors that were classified at three spatial scales (plot, patch and badland). An object-oriented approach on high resolution multispectral images was used to classify physiognomic vegetation types in five biancane badlands. Within each badland, data on vascular plant species abundance were collected using a stratified random design. Variation partitioning based on partial Redundancy Analysis (pRDA) was used to evaluate the contribution of three sets of environmental predictors, recorded at the spatial scales of plot, patch, and biancane badland in explaining patterns in plant community composition. The full set of environmental variables accounted for 15.5% of the total variation in plant community composition (8.5 %, 1% and 3.3% respectivelywere the pure effect of plot, patch and badland variables). Environmental variables measured at the level of plot and expressing soil characteristics played a major role in determining patterns of plant species composition, consistent with previous findings. In particular, high soil electrical conductivity was an important determinant of the persistence of annual grassland communities that supports the endemic species Artemisia caerulescenssubsp.cretacea.On less saline soils, two perennial grassland community types, characterized by wider ecological amplitude (Bromus erectus grasslands and grasslands supporting ruderal species), differed in their response to increases in nitrogen availability. The former and most valuable grassland communities (Bromus erectus grasslands and Bromus erectus grasslands with shrubs) were positively associated to C/N ratio. Conversely, grassland communities dominated by ruderal species, such as Phalariscaerulescens, Avenafatua, and Dasypyrumvillosum, was mainly found in soils characterized by high soil nitrogen availability.Patch scale predictors confirmed that in biancane badlands ecosystems erosion and deposition processes are important determinants of vegetation patterns in these landscapes: biancane pediments, characterized by a regular shape, supported annual grasslands that were clearly distinct from grassland communities recorded from patches characterized by a high shape index. Overall, the contribution of surface area of biancane badlands in determining the composition of the vegetation of these badlands was lower compared to that of local environmental variables measured at the spatial scale of plot.
In the smallest badlands, Bromus erectus perennial grasslands were absent, while annual grasslands, linked with harsh soil conditions (i.e. high soil salinity), were not affected by either the surface area of biancane badlands or by the soil nitrogen availability. Due to the intensely-dissected nature of biancane badland landscapes, generalization on conservation management are very difficult, reinforcing the idea of relying on habitat-instead of area-focused conservation practices and the identification of the major predictors of patterns in remnant vegetation requires conducting investigations at multiple spatial scale. The conservation of valuable Bromus erectus grassland, requires preventing a further reduction in size of the biancane badlands.