



HAL
open science

Trait-based assembly rules across climatic gradients of European grasslands

C. Wellstein, A. Jentsch, Stefano Chelli, G. Campetella, R. Canullo, I. Apostolova, Juliette Bloor, K Cianfaglione, J. Dengler, Philipp von Gillhaussen, et al.

► To cite this version:

C. Wellstein, A. Jentsch, Stefano Chelli, G. Campetella, R. Canullo, et al.. Trait-based assembly rules across climatic gradients of European grasslands. 57th annual symposium of the international Association for Vegetation Science -Biodiversity and vegetation: patterns, processes, conservation, Sep 2014, Perth, Australia. 1 p., 2014. hal-02795400

HAL Id: hal-02795400

<https://hal.inrae.fr/hal-02795400v1>

Submitted on 5 Jun 2020

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Trait-based assembly rules across climatic gradients of European grasslands

Camilla Wellstein (1), Anke Jentsch (2,3), Stefano Chelli (4), Giandiego Campetella (4), Roberto Canullo (4), Iva Apostolova (5), Juliette Bloor (6), Kevin Cianfaglione (4), Jürgen Dengler (2,7,8), Philipp von Gillhaußen (2), Behlül Güler (9), Judit Házi (10), Cecília Komoly (10), Jürgen Kreyling (3,7), Julien Pottier (6), Gábor Szabó (10), Tsvetelina Terziiska (5), Emin Uğurlu (9), Zita Zimmermann (10) & Sándor Bartha (10)

- 1) Faculty of Science and Technology, Free University of Bozen, Universitätsplatz 5, I-39100 Bozen, Italy
- 2) Disturbance Ecology, University of Bayreuth, Universitätsstr. 30, D-95447 Bayreuth, Germany
- 3) Bayreuth Center of Ecology and Environmental Research (BayCEER), University of Bayreuth, Universitätsstr. 30, D-95447 Bayreuth, Germany
- 4) Plant Diversity and Ecosystems Management Unit, School of Biosciences & Veterinary Medicine, University of Camerino, Via Pontoni 5, I-63032 Camerino (MC), Italy
- 5) Institute of Biodiversity and Ecosystem Research, Bulgarian Academy of Sciences, G. Bonchev Str. Block 23, 1113 Sofia, Bulgaria
- 6) INRA, UR0874 Grassland Ecosystem Research Unit, 5 Chemin de Beaulieu, F-63100 Clermont-Ferrand, France
- 7) Biogeography, University of Bayreuth, Universitätsstr. 30, D-95447 Bayreuth, Germany
- 8) Synthesis Centre (sDiv), German Centre for Integrative Biodiversity Research (iDiv) Halle-Jena-Leipzig, Deutscher Platz 5e, D-04103 Leipzig, Germany
- 9) Biology, Faculty of Science & Letters, Celal Bayar University, Muradiye, Yagcilar Campus, 45140 Manisa, Turkey
- 10) Centre for Ecological Research, Hungarian Academy of Sciences, Alkotmány út 2-4, H-2163 Vácrátót, Hungary

Background & Aims: Trait-based studies of species assembly can reveal mechanisms of species coexistence. European grasslands support a rich flora with high small-scale species density, mirroring intricate coexistence mechanisms. These mechanisms might show differences related to climate, soil conditions and disturbance history of a site. We compare assembly rules across European grasslands differing in climate, soil and land use history.

Study sites: We investigated fine-scale patterns of trait-based community assembly in European grasslands across continental gradients within the framework of the BiodivERsA project SIGNAL. The gradient extends from the mesic grasslands in France and Germany (mean annual precipitation/MAP: 750–1200 mm; mean annual temperature/MAT: 8° C to 7° C, resp.), to intermediate ones in Italy and Bulgaria (MAP: 880–560 mm; MAT: 12.1° C to 10.2° C, resp.), to xeric ones in Turkey and Hungary (MAP: 715–550 mm; MAT: 16.7° C to 10.5° C, resp.). The sites also differ in management, disturbance history, geology and edaphic factors. They represent common types of grasslands of the respective study country.

Methods: Fine-scale patterns of species combinations (rooting individuals) were sampled in 2.80 m X 0.40 m blocks, subdivided into 448 micro-quadrats of 25 cm² (5 cm X 5 cm). To account for within site heterogeneity, six blocks were sampled at each site. Specific leaf area (SLA), plant height and seed mass were assessed, using literature sources and direct measurements, for all recorded vascular herbaceous species. Based on these traits, Rao's functional diversity was calculated for each micro-quadrat and compared to a null model. We used Schamp's method for randomization: keeping the abundances of species and the local species richness as in the field and assigning traits at random to each species combination. Deviation of functional diversity from random expectation was interpreted as trait divergence or trait convergence.

Main Results & Interpretations: Several occurrences of trait-based assembly rules could be detected across countries. The strongest deviations from randomness in terms of seed mass were found in the Turkish grassland (driest one). In Bulgaria, Hungary, France and Germany, by contrast, we detected convergence of seed mass. Strong convergence of plant height appeared in tall mesic grasslands of Germany and France, while this trait showed random pattern in dry grasslands. The Turkish grassland showed convergence for SLA. Similar tendency occurred at the German and the Italian sites while those of France and Bulgaria mostly showed random patterns. Italian grasslands (spatially very close) showed both convergence and divergence of seed mass indicating heterogeneous environmental conditions and/or complex site history. We conclude that assembly rules can be contrasting and context dependent at different grassland sites and climatic differences are often masked by local factors such as disturbance regime or soil heterogeneity.

Acknowledgements: This work was carried out within the project SIGNAL, funded by the ERA-Net BiodivERsA, with the national funders Belgian Science Policy Office (belspo), German Federal Ministry of Education and Research (BMBF), Bulgarian Science Fund and Ministère de l'Écologie, du Développement durable et de l'Énergie (France) as part of the 2011-2012 BiodivERsA call for research proposals.

Correspondence: Sándor Bartha, bartha.sandor@okologia.mta.hu

Wellstein, C., Jentsch, A., Chelli, S., Campetella, G., Canullo, R., Apostolova, I., Bloor, J., Cianfaglione, K., Dengler, J., von Gillhaußen, P., Güler, B., Házi, J., Komoly, C., Kreyling, J., Pottier, J., Szabó, G., Terziiska, T., Uğurlu, E., Zimmermann, Z. & Bartha, S. 2014. Trait-based assembly rules across climatic gradients of European grasslands. In: Mucina, L., Price, J.N. & Kalwij, J.M. (eds.), *Biodiversity and vegetation: patterns, processes, conservation*, p. 266. Kwongan Foundation, Perth, AU.