CAMPUS AGRÁRIO DE VAIRÃO | PORTUGAL

HABITAT FRAGMENTATION AND EDGE EFFECTS SEMINAR 15.11.13

14h30 | THE EDGES PROJECT: FRAGMENTATION IN IBERIAN FARMLAND LANDSCAPES

Luís Reino, CIBIO/InBIO, Portugal

This introductory talk will present the context of the EDGES project related to the work developed by the research team in the last decade in the field of farmland ecology. Socio-economic changes in Mediterranean farmland habitats have caused the abandonment of less fertile arable land in many regions. Together, these relatively recent changes in land use patterns have progressively resulted in the loss and fragmentation of many arable habitats for farmland birds. Overall results suggested that changes like afforestation may have contrasting impacts in the breeding bird community, but with negative effects in avian steppe species.

14h45 | USING LANDSCAPE HISTORY TO PREDICT BIODIVERSITY PATTERNS IN FRAGMENTED LANDSCAPES

Robert M. Ewers, Imperial College London, UK

Landscape ecology plays a vital role in understanding the impacts of land-use change on biodiversity, but it is not a predictive discipline, lacking theoretical models that quantitatively predict biodiversity patterns from first principles. Here, we draw heavily on ideas from phylogenetics to fill this gap, basing our approach on the insight that habitat fragments have a shared history. We develop a landscape 'terrageny', which represents the historical spatial separation of habitat fragments in the same way that a phylogeny represents evolutionary divergence among species. Combining a random sampling model with a terrageny generates numerical predictions about the expected proportion of species shared between any two fragments, the locations of locally endemic species, and the number of species that have been driven locally extinct. The model predicts that community similarity declines with terragenetic distance, and that local endemics are more likely to be found in terragenetically distinctive fragments than in large fragments. We derive equations to quantify the variance around predictions, and show that ignoring the spatial structure of fragmented landscapes leads to over-estimates of local extinction rates at the landscape scale. We argue that ignoring the shared history of habitat fragments limits our ability to understand biodiversity changes in human-modified landscapes.

15h15 | DELINEATION OF LANDSCAPE ELEMENTS USING THE WATERSHED AND WATERFALL TRANSFORM

Véronique Lefebvre, Imperial College London, UK

The relationship between ecological processes and spatial patterns is only meaningful when the landscape structure is represented in the same way that it is perceived by the studied species and at the scale of the process or function under consideration. However, measures quantifying spatial heterogeneity in remotely sensed images are often shaped by technical constraints rather than by ecological relevance. We suggest a computational method for landscape delineation that can address the challenge of characterising the spatial context as perceived functionally and at multiple scales. This approach is able to provide multiple alternative representations of the same landscape from a single image depending on the species or process studied. The technique can be applied to a variety of landscape delineation problems, as for instance the delineation of homogenous zones and transitions on an intensity map (Normalized Difference Vegetation Index) or the delineation of habitat fragments on a binary forest/non-forest map, as potentially perceived by different species. We argue that tuning landscape representations to functional traits of species using our delineation method, which is set to be tested on abundance data collected in fragmented forest landscapes for a range of animal species, will improve the identification of patterns in biodiversity responses to fragmentation.

15h45 | EFFECTS OF FRAGMENTATION ON CLIMATE-DRIVEN MIGRATION OF FOREST UNDERSTOREY PLANTS

Stefan Dullinger, Universtität Wien, Austria

Climate warming might force species to shift their ranges faster than less mobile organisms like plants will be able to migrate. Besides factors like the inherently low frequency of long distance seed dispersal events, habitat fragmentation has been hypothesized to represent a major obstacle for rapid plant migration. However, the magnitude by which the human alteration of natural landscapes has reduced possible plant migration rates has never been quantified at larger scales. Here, we use a simulation model to compare potential movement velocities of understorey herbs within continuous forest landscapes to those achievable under both current and predicted future forest fragmentation levels in Europe. Preliminary results show that, first, these plants will likely be too slow to track climate warming even if forest cover would not have been fragmented; and, second, that under the remaining forest distribution these rates will be further reduced considerably across large parts of Europe. Predicted land cover development until the year 2080 will not improve these figures significantly, except for some parts of eastern Europe. We conclude that for many European forest plant populations phenotypic or genetic adaptation might be the only available strategies to survive under a warming climate.

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