III - Terrestrial biodiversity, ecosystems and nature conservation

Parallel session C –Tuesday 11th March 2014 11:00-12:30

ID: [221]

Title: **IDENTIFYING TIPPING POINTS IN MEDITERRANEAN WOODLAND ECOSYSTEM BASED ON EARLY WARNING ECOLOGICAL INDICATORS**

Authors: Cristina Branquinho[1]; Pedro Pinho[2]; Alzira Ramos[3]; Maria João Pereira[3]; Alice Nunes[4]; Melanie Batista[1]; Paula Matos[4]; Adriana Silva[1]; Andreia Ferreira[1]; Lúcio do Rosário[5]; Otília Correia[1]

Institutions: [1]Universidade de Lisboa, Faculdade de Ciências, CBA-Centro de Biologia Ambiental; [2]Universidade de Lisboa, Faculdade de Ciências, CBA-Centro de Biologia Ambiental & CERENA-Centre for Natural Resources and the Environment, Instituto Superior Técnico, Universidade de Lisboa; [3]CERENA-Centre for Natural Resources and the Environment, Instituto Superior Técnico, Universidade de Lisboa; [4]Universidade de Lisboa, Faculdade de Ciências, CBA-Centro de Biologia Ambiental & CESAM-Centre for Environmental and Marine Studies, Universidade de Aveiro; [5]Instituto da Conservação da Natureza e das Florestas

Ecosystems have critical thresholds, called tipping points, at which the system changes abruptly to an alternative state. Once that threshold is crossed, a switch back to the initial state of the system may be impossible leading to losses in biodiversity, ecosystem services and human well-being. Under current global change, climate-driven tipping points are extremely difficult to forecast, thus early warning signals, indicating the imminence of an irreversible ecosystem transition, are of critical importance. However, the first signs of ecosystem change are either too small or too complex to be measured by conventional means. Therefore, we propose to use integrated ecological surrogates of the structure, composition and function of ecosystems, named ecological indicators.

In south-west Europe, we characterized semi-natural woodland along a spatial climatic gradient. We included climatic transitions, from sub-humid to semi-arid areas and evaluated different types of potential early warning signals: i.) functional groups of herbs, shrubs and lichens; ii.) plant biomass, height and leaf specific weight of trees, shrubs and herbs. We then upscale the results using remote sensing information both at spatial and temporal scale. Based on the identification of abrupt transitions we identify ecosystems tipping points and based on climatic scenarios we identified the most vulnerable areas. Using this information environmental policies and local woodland management can be adapted in order to sustain ecosystem functioning and services anticipating future climate alterations.

Presenter

Name: Cristina Branquinho

Email: cmbranquinho@fc.ul.pt

ID: [220]

Title: **EMBEDDING CLIMATE CHANGE ADAPTATION INTO NATIONAL NATURE RESERVES**

Authors: Simon Duffield[1]; Ben Le Bas[1]
Institutions: [1]Natural England

England's 224 National Nature Reserves (NNRs) form part of a UK-wide network of nature reserves covering England, Scotland, Wales and Northern Ireland and include some of the best examples of England's wildlife. They represent a key resource for Natural England, as amongst other things they provide the opportunity to test the practical application of research and development.

With this in mind, Natural England developed a methodology to embed climate change adaptation into the long term vision and management of NNRs. As well as safeguarding biodiversity on NNRs in the long-term, the aim is that NNRs will demonstrate best practice that can be used as case studies to inform and inspire other land managers developing their own response to climate change.

The approach aims to combine the latest scientific information on projected climate change and the likely impact on the natural environment with on the ground detailed knowledge of the state and vulnerability of the key features of the reserves. The methodology uses four simple steps (projected change – impacts – vulnerability – response) to enable site managers to identify appropriate adaptation for their reserves without the need for assistance from climate change specialists.

Key challenges were around; the need to provide concise summaries of the projected climate change for their particular regions, without for excessive detail and complexity; providing information on the likely impact of climate change on the broad suite of features found on NNRs, moderating site managers views on the vulnerability of features on their NNR and providing guidance on adaptation in a form that is detailed enough to inform practical management, but flexible enough to be adapted to local conditions.

This paper will present a summary of the methodology, highlight the various challenges that it needed to overcome and show what the results look like using a range of case studies from NNRs that have implemented the approach.

Presenter

Name: Simon Duffield

Email: simon.duffield@naturalengland.org.uk

ID: [264]

Title: **SOWN BIODIVERSE PASTURES AS A CARBON SINK AND A SOLUTION TO REVERSE THE DEGRADATION OF ARID AND SEMI-ARID ECOSYSTEMS**

Authors: Ricardo F. M.Teixeira[1]; Vânia Proença[2]; Tatiana Valada[2]; David Crespo[3]; Tiago Domingos[2]
Institutions: [1]University of Antwerp; [2]University of Lisbon; [3]Fertiprado, Seeeds and Nutrients, Ltd.

Sown biodiverse permanent pastures rich in legumes started being developed in Portugal in the second half of the 1960`s as an economically rational strategy to increase grassland productivity, by sowing mixes of up to 20 species/cultivars of legumes and grasses, including a minimum of 25% legumes. In addition to the greater photosynthetic capacity and nutrient content, the use of species rich seed mixtures tailored to each site, also allows a greater adaptability of the pasture to soil and annual weather variations, and a greater resilience to environmental factors. Evidence shows this system is an economic and ecological win-win solution that answers many of the causes for degradation in Mediterranean ecosystems. Compared to natural pastures, sown biodiverse pastures provides higher yields of better quality pasture (i.e. higher quantity and quality of food for animals, without the need for nitrogen fertilizers or annual soil mobilization), more soil organic matter (estimated as, on average, a threefold increase in 10 years) and more carbon sequestration in the soil (average of 6.5 t CO_2/hectare over a period of 10 years). Soil organic matter pools are replenished and soil structure reposed thus reverting soil degradation. Associated environmental benefits include decreased water runoff and soil erosion and lower fire risk. The high increase in stable soil organic matter acts as a carbon sink, turning the system into an optimum tool for climate change mitigation and adaptation.

Presenter

Name: Vânia Proença

Email: vaniaproenca@gmail.com

ID: [39]

Title: **THE CLIMATE CHANGE VULNERABILITY INDEX: A NEW METHOD FOR SUPPORTING ADAPTIVE MANAGEMENT OF STREAM ECOSYSTEMS IN EUROPE**

Authors: Yaron Hershkovitz[1]; Veronica Dahm[1]; Armin Lorenz[1]; Daniel Hering[1]
Institutions: [1]University of Duisburg-Essen

Adaptation to climate change (CC) requires an adjustment in natural or human systems for reducing actual or expected climatic impacts, or their effects. According to the latest EU guidelines on climate change and Natura 2000 (2013), freshwater habitats are considered as one of the most vulnerable habitat groups. The impacts of CC are predicted to exacerbate human pressures on aquatic ecosystems, negatively impacting their biodiversity and functionality. It is therefore necessary to prioritize areas of interest where CC adaptation measures could be applied for protecting species sensitive to the impacts of CC. For this purpose we developed a trait-based biotic index (Climate Change Sensitivity Index - CCSI) using three insect orders: mayflies, stoneflies and caddisflies (EPTs).

We selected six criteria of potential sensitivity to CC: endemism, micro-endemism, temperature preference, elevation preference, stream zonation, and life history (life duration and voltinism). EPT species (n=2039) were assigned with a score ranging from 0 (not sensitive) to 6 (highly sensitive). The applicability of the index was exemplified over three scales: (1) Continental Europe, (2) the German Federal State of North-Rhine Westphalia (NRW) and (3) the River Ruhr basin, a catchment of about 4500 sq km within NRW.

Using data collected over routine regional sampling we show that although no endemic EPTs were found in NRW, eight species can still be identified as relatively sensitive to CC (CCSI of 3). Almost all of them are found in the Sauerland and Rur Eifel, the 'mountainous' regions of NRW (> 200 m a.s.l.). The upper reaches of the Ruhr catchment have been identified to be relatively rich with sensitive species, including several locally rare ones.

Water managers and practitioners will find the new index as a helpful tool for identifying "hotspots" in terms of climate vulnerability or climate change refuge areas that can be considered for protection or to apply restoration measures on a local, as well as on a regional scale.

Presenter

Name: Yaron Hershkovitz

Email: yaron.hershkovitz@uni-due.de