CURRENT THEMES IN ECOLOGY

Eco-informatics:

The silver bullet for ecology?

Thursday December 8th, 2011

Turingzaal
Centrum voor Wiskunde en Informatica (CWI)
Amsterdam

PROGRAMME

Chair of the Day: Joop Schaminée

9:30 - 10:00	**Registration and coffee**
10:00 - 10:40	**The evolution of eco-informatics** Willem Bouten (IBED, University of Amsterdam) and Joop Schaminée (Wageningen University / Radboud University)
10:40 - 11:20	**Bioinformatics and ecological genomics** Jeroen Raes (University of Brussels) and Yves Van de Peer (Gent University)
11:20 - 12:00	**Taxonomic versus phylogenetic diversity patterns; An ecological niche modelling approach** Niels Raes (Netherlands Centre for Biodiversity Naturalis, section NHN, Leiden University), Campbell Webb, (The Arnold Arboretum, Harvard University) and Ferry Slik (Xishuangbanna Tropical Botanical Garden, China)
12:00 - 13:00	**Lunch**
13:00 - 13:40	**Analysing traits across plant communities: opportunities and challenges** Wim Ozinga (Alterra, Wageningen-UR) and Verena Cordlandwehr (Oldenburg University and Groningen University)
13:40 - 14:20	**Along the technology and informatics highway, please exit at field work** Judy Shamoun-Baranes (IBED, University of Amsterdam), Kees Camphuysen (Royal Netherlands Institute for Sea Research) and Theunis Piersma (University of Groningen / Royal Netherlands Institute for Sea Research);
14:20 - 15:00	**Climate change effects on species distributions: the need for better data, models, and ecology** Robert Jan Hijmans (UC Davis, USA) and John Wieczorek (UC Berkeley, USA)
15:00 - 15:30	**Tea**
15:30 16:10	**Forum Discussion (Chair Joop Schaminee)** • Jan van Groenendael (Gegevensautoriteit Natuur) • Peter van Tienderen (Director LifeWatch Nederland) • Robert Jan Hijmans (UC Davis) • Jeroen Raes (University of Brussels)
16:10 - 16:20	**One-minute introductions to demonstrations**
16:20 - 17:30	**Demonstrations and drinks** 1. Stephan Hennekens (ALTERRA): SynBioSys Netherland – data on the march 2. Mike Kemp (IBED): Virtual Lab for Bird Migration Modelling 3. Cees Hof (GBIF): Sharing data through the infrastructure of the Global Biodiversity Information Facility (GBIF); state of the art and future developments. 4. Tijs de Kler (SARA) LifeWad infrastructure for collaborative research in the Wadden sea 5. Edwin Baaij (Technologiecentrum UvA): BirdTracking System: Monitoring, data management, visualization and interpretation 6. Reneé Bekker (Gegevensautoriteit Natuur): Dutch Biodiversity of the Map 7. Caspar Hallmann (SOVON): TRIMmaps: from plot counts to maps of the changing distribution
17:30	**End**

ORGANISERS:

Prof. Dr. Ir. Willem Bouten (University of Amsterdam)

Prof. Dr. Joop Schaminée (Wageningen University / Radboud University)

Dr. Claudius van de Vijver (NERN)

SUPPORTED BY:

NERN

LIFEWATCH

NWO Aard- en Levenswetenschappen (NWO-ALW)

Netherlands Institute of Ecology (NIOO-KNAW)

Graduate Schools PE&RC, SENSE and E&E

ABSTRACTS

THE EVOLUTION OF ECOINFORMATICS

Willem Bouten (Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam) and **Joop Schaminee** (Plant Ecology, Wageningen University / Radboud University)

We live in an age of increased awareness of the close interdependence between humans and nature. The globalization of social, economic and political processes combined with increasing human impacts on the earth system necessitates a better understanding of the interrelationship between human activities and natural processes at a wide range of spatial and temporal scales. The technology push generates fundamentally new opportunities to study the complex patterns and processes of a changing planet. These concern both observation techniques such as DNA-microarrays to global sensor networks and satellite remote sensing but also ICT developments that facilitate collaboration, data exchange and information management, GIS applications, data analyses and modelling strategies. We will show some examples where ecology meets with technology and we will compare these to the turning points in the evolution of meteorology. We thus want to initiate the discussion on how technology could enhance ecological sciences and how ecology could generate a technology pull.

BIOINFORMATICS AND ECOLOGICAL GENOMICS

Jeroen Raes (University of Brussels) and **Yves Van de Peer** (Gent University)

Meta-omics (metagenomics, metatranscriptomics, metaproteomics) are powerful tools for the analysis of the (unculturable fraction of) microbial communities. Because of its complexity, meta-omics data has required the development of novel computational analysis tools to determine the functional and phylogenetic composition of the sampled community (Raes et al., Curr Opin Microbiol 2007).

However, to go from a metagenomic ‘parts list’ (i.e. a bag of genes) to an initial understanding of the ecosystem structure and functioning, current tools are not sufficient (Raes & Bork, Nat Rev Microbiol 2009). I will present a range of approaches to analyze metagenomes, infer ecological parameters, extract species interaction and competition relationships, interpret metabolic changes and identify biologically and ecologically relevant features from meta-omics data with applications in diverse environments.

TAXONOMIC VERSUS PHYLOGENETIC DIVERSITY PATTERNS; AN ECOLOGICAL NICHE MODELLING APPROACH

Niels Raes (Netherlands Centre for Biodiversity Naturalis, section NHN, Leiden University), **Campbell Webb** (The Arnold Arboretum, Harvard University) and **Ferry Slik** (Xishuangbanna Tropical Botanical Garden, China)

The number of specimens stored in Natural History Museums and herbaria that have become available in digitized format has increased exponentially over the last decade. These data have opened the opportunity to develop quantitative patterns of biodiversity without having to rely on subjective expert opinions. We show how information on the occurrences of species derived from digitized botanical collections of South East Asia (SEA) is related to abiotic environmental gradients using species distribution models (SDMs) to develop high spatial resolution maps of taxonomic diversity (TD) and -endemicity. We compare our results with previously published expert maps to confirm their knowledge, but more importantly, to point out previously not recognized areas of high TD.

Secondly, advances in the field of phylogenetics have resulted in a growing number of phylogenies being published on the internet. Recent analyses on the birds of France have revealed a mismatch between patterns of TD and phylogenetic diversity (PD), where high PD represents a long evolutionary history of the members of a community. In a pilot we compare the TD and PD patterns of SEA, both based on botanical collections and interpolated with SDMs, and discuss the implications for biological conservation.

ANALYSING TRAITS ACROSS PLANT COMMUNITIES: OPPORTUNITIES AND CHALLENGES

Wim A. Ozinga (Alterra, Wageningen UR / Radboud University Nijmegen) and **Verena Cordlandwehr** (University of Groningen / University of Oldenburg)

Eco-informatics offers exiting new possibilities for community ecology. Patterns in species composition across local plant communities are driven by variation in habitat quality and habitat configuration, which act as filters that admit or exclude species from the available species pool according to their functional traits. The combination of large vegetation databases (with information on co-existing plant species within plots) and trait databases (with information on species' trait values) provides challenging opportunities to analyse the effect of niche-based processes and dispersal processes on the assembly of plant communities.

We present two examples of the joint analysis of species co-existence data and trait data. On the local scale we use long term monitoring data of changes in species composition to show that subtle changes in environmental conditions due to slightly different management regimes can trigger changes in trait composition. On the regional scale we link the degree of ‘niche filling’ (i.e. the degree to which plant species can track suitable habitat patches) to traits. Although niches are central to community ecology, they are notoriously difficult to quantify. Vegetation databases, however, allow the multivariate quantification of niche dimensions of plant species based on gradients in species composition. Based on these two examples we identify several opportunities that the new field of eco-informatics offers for community ecology.

ALONG THE TECHNOLOGY AND INFORMATICS HIGHWAY, PLEASE EXIT AT FIELD WORK

Judy Shamoun-Baranes (Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam), **Kees Camphuysen** (Royal Netherlands Institute for Sea Research) and **Theunis Piersma** (University of Groningen / Royal Netherlands Institute for Sea Research);

In an age where environmental dynamics can be observed from space, measurements of animal behaviour can be obtained without leaving your office, and ecosystem dynamics can be simulated, researchers and funding agencies may have become complacent in their attitude towards field work. We focus on two examples of how technological advances and long-term field studies complement each other to improve our understanding of the interactions between organisms and their environment. The first example explores the diversity of foraging strategies in lesser black-backed gulls in relation to resource availability and breeding ecology. The second example shows how wind, stopover ecology and physiology may influence Afro-Siberian red knots. Embedding technology and informatics into long term ecological studies is promising and requires mutual investments and close collaboration between people with diverse expertise.

CLIMATE CHANGE EFFECTS ON SPECIES DISTRIBUTIONS: THE NEED FOR BETTER DATA, MODELS, AND ECOLOGY

Robert Hijmans (University of California-Davis) and **John Wieczorek** (University of California-Berkeley)

The environmental informatics revolution of the past decades has provided vast amounts of data for ecological research. Initial fears and resistance to publishing raw data is being replaced by a requirement to do so, in response to efforts to make publicly funded research accessible and repeatable. We discuss some of these developments, with an emphasis on species occurrence and environmental data, in the context of predicting climate change effects on species distributions. Data availability does not imply that data is easy to use, but a number of relatively simple and flexible solutions have worked, whereas supposedly ideal approaches are rarely being adopted and can be a hindrance to use. Next generation web-based tools should improve data access and exploration. Whether data is fit for use, and how it should be used, is a question for individual researchers to answer. We illustrate that with examples on gorillas and endemic plants. A major future challenge is to make available vast amounts of data via cloud computing approaches, such that they can be used with programs like R that provide a flexible framework for data analysis.