YCCSA Seminar Series
Spring 2017

An interdisciplinary seminar series hosted by the York Centre for Complex System Analysis aimed at researchers from all disciplines

The impact of global change on the structure, stability and evolution of complex food webs

Dr Korinna Allhoff

Institute of Ecology and Environmental Sciences, Paris

20 January 2017
Ron Cooke Hub, RCH/204 at 13:30

Abstract:

A critically important challenge in theoretical ecology is to better predict responses of ecological networks to global change, such as global warming or increasing rates of species invasions. Both have been observed to trigger changes in species' interactions and abundances and potentially cause catastrophic extinction cascades. Classical food web models have focused on explaining and predicting such ecological responses on relatively short time scales and often fail to consider eco-evolutionary processes that influence the structure, stability and functioning of food webs on longer time scales. I address these issues using an eco-evolutionary model, which is based on body masses and diets as the key traits that determine metabolic rates and species interactions. Evolutionary processes are modelled via trait evolution, so that the network structure itself evolves in a self-organized manner and reacts to changing environmental conditions.
I will focus on global warming during the first part of my talk. Temperature dependence is included into the population dynamics via the Arrhenius equation. I analyse the resulting network structures for a broad range of diff erent temperatures and I fi
nd that higher temperatures generally lead to the emergence of more bottom-heavy networks with fewer trophic levels. During the second part of my talk, I will consider recurrent invasion events. My model thus integrates classical assembly models, which describe the emergence of a food web via sequential invasions, with large community evolution models, which describe food web emergence via speciation due to small mutation steps. I vary the frequency of invasion events in relation to mutation events and the relatedness between native species and invaders. I then analyse the structure and stability of the emerging network and I find that the most diverse and stable networks emerge in systems with frequent invasions of species relatively similar to native species.

The seminar includes a refreshment break

Ron Cooke Hub is on Heslington East Campus – accessible by free bus services Nos. 66 and 44 running at frequent intervals from Heslington West.
The YCCSA Seminar room is on the second floor

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