



SCIENTIFIC MEETING

## **UNDERSTANDING VARIATION IN POPULATION SIZES: DOES THE BIOLOGICAL MODEL MATTER?**

Tuesday, 10 March 2009

The Meeting Rooms, The Zoological Society of London, Regent's Park, London NW1 4RY

**Chair: Dr Nathalie Pettorelli, Post-Doctoral Research Fellow, Institute of Zoology, ZSL**

### **Density structured models: an empirical approach for large-scale modelling**

*Professor Rob Freckleton, Department of Animal and Plant Sciences, University of Sheffield, UK.*

The biggest problem in population modelling is in getting enough data: often modelling is compromised by population time series that are too short or not collected at large enough spatial scales.

I will talk about density-structured models which offer a simple modelling approach, and use data that can be collected rapidly over large areas.

### **Studying cycles and waves in populations: challenging and updating ecological theory when studying large-scale processes**

*Professor Xavier Lambin, Institute of Biological and Environmental Sciences, University of Aberdeen, UK.*

Studying population dynamics when they are affected by processes operating over large spatial scales presents great challenges to ecologists. While theory is well developed on the potential for trophic interactions to cause population cycles and travelling waves, testing and updating such theories requires a combination of large-scale descriptive surveys, demographic analyses, manipulative experiments, and a judicious dialogue between theoretical and empirical studies. I will describe advances and failures in the application of this pluralistic approach to the understanding of the ecological processes that underpin oscillations of populations in time and space, with special emphasis on the role of pathogens and predators.

## **Is the Devil in the detail? How much do we need to know to understand population dynamics?**

*Professor Tim Coulson, Professor of Population Biology, Imperial College London, UK.*

The dynamics of any population are determined by fluctuations in birth and death rates. Population biologists have reported that numerous factors can influence birth and death rates including weather, competition for food, behaviour, dominance, morphological traits like body size and genotype. In this talk I will explore how incorporation of such factors into analyses and models impacts our understanding and ability to predict and manage population dynamics. I will primarily use examples from wild mammals.

## **Estimation of individual fitness components: looking for a needle in a haystack?**

*Emmanuelle Cam, Laboratoire Évolution et Diversité Biologique, Bâtiment 4 R3 - B2. 118 Route de Narbonne. Université Paul Sabatier Toulouse III. 31062 Toulouse Cedex 09, France.*

Biologists focusing on wild vertebrates have long been collaborating with statisticians to address questions about demography. However, there is an old tension between biologists and statisticians, the former blaming the latter for designing estimation methods corresponding to unrealistically simple populations or systems, the latter doubting that appropriate data could ever be collected to match the requirements of complex models (i.e., appropriate sampling design and large sample sizes in the different strata within populations). This reflects a fundamental difference between the conceptual foundations of evolutionary ecology and population ecology. Historically, populations have often been viewed as homogeneous sets (or sets whose heterogeneity can be ignored) by mathematical demographers interested in factors influencing population dynamics, whereas the genetic uniqueness of the composing individuals is central to evolutionary biology. Ideally, evolutionary ecologists would like to apply the concept of genetic “uniqueness” of individuals to demographic parameters as well. However, estimating individual-specific demographic parameters is a formidable challenge. To date, appropriate techniques have been implemented in only a handful of studies. New technical and conceptual challenges are emerging, such as heritability in individual-specific demographic parameters and the relationship between individual fitness and “population fitness”.