Avian productivity in relation to climatic extremes: can Citizen Science help us to understand the urbanizing world?

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Summary – The world is urbanising rapidly, such that 67% of the global human population will be living in urban areas by 2050. This change in cityscapes has profound potential consequences for urban habitat structure; but we understand little about how animal taxa respond. In addition, climatic extremes are predicted to become more frequent and extreme in magnitude with phenological changes are occurring already changing the availability of prey items. This project ***aims*** to test how breeding birds respond to such challenges. To do this, we will compare the productivity of small passerine populations nesting along an urban-rural gradient at two different scales (city and national) using an innovative citizen science programme; and will examine detailed autecological work at the local scale through an 'on-the-ground' study of birds in the city of Birmingham. It will also examine broader phenological and climate-driven fluctuations over the longer term at a national scale using the British Trust for Ornithology's (BTO's) breeding and ringing datasets. We will work closely with our NGOpartner, the BTO, to develop greater insights of how birds respond under ever-changing breeding conditions.

Project Description Urbanization results in large shifts of human populations (e.g. 67% of the global population will live in urban areas by 2050[1]) with concomitant dramatic changes in habitat structure, including fragmentation, a loss of connectivity and generally a reduction in the area of green space. In addition, we are currently experiencing climate change and an increased frequency of climatic extremes. Knowledge exists on how birds respond to urbanisation through changes in their life history such as an adaptive reduction in clutch loss[2], but little is known on how avian populations will respond to the dual challenges of greater urbanization in their breeding and over-wintering habitats and of an increased likelihood of exposure to climatic extremes[3] and shifting climatic regimes.

The project will examine how avian productivity responds to climate extremes and climate variability when breeding in different habitats across an urban-rural gradient. The research will take place along two spatio-temporal scales: (1). at the local short-term scale through fieldwork across the city of Birmingham over three field seasons; and (2). at a nationwide long-term scale through desk-based work at the BTO examining CES and NRS data across multiple years. Fine-scale climatic data are available via the HiTEMP climate laboratory in GEES. Work is underway with the BTO on a project examining how avian populations respond to climate-driven extremes in hydrological parameters of rivers[3] and we will be looking to extend our collaborative capabilities through this PhD. We will select cavity (i.e. nestbox-) breeding species such as parids for the focus of the research as we have much experience in working with them[(e.g. 4)] in the Centre for Ornithology and they are well-represented in the NRS. The project will also have an innovative Citizen Science[5] element based around a 'nest-box adoption' scheme. This is key as research funders remain committed to 'public outreach' which is increasingly seen as a fundamental component of carrying out science[6]. Ornithology has been at the cutting edge of citizen-driven science with initiatives such as Project FeederWatch in North America. The BTO runs similar Citizen Science projects here in the UK which include the Nest Record Scheme (NRS)[7] and is in a strong position to engage in such outreach.

References: [1]http://esa.un.org/unup/pdf/WUP2011_Highlights.pdf; [2]Chamberlain, D.E. *et al*. 2009. Avian productivity in urban landscapes: A review and meta-analysis. *Ibis*, **151**, 1–18; [3]Royan, A. *et al*. In press. Avian community responses to variability in river hydrology. *PLoS ONE*; [4]Harrison, T.J.E. *et al*. ., 2010. Does food supplementation really enhance productivity in breeding birds? *Oecologia* **164**: 311–320; [5]Dickinson, J.L. & Bonney, R. 2012. *Citizen Science: Public Participation in Environmental Research*. Comstock Publishing Associtess, Ithaca, NY, USA; [6]http://www.wellcome.ac.uk/News/Media-office/Press-releases/2013/Press-releases/WTP054189.htm; [7]http://www.bto.org/volunteer-surveys/nrs; [7]http://www.bto.org/volunteer-surveys/ringing/surveys/ces.

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