A flexible dynamic occupancy model to estimate non-linear effects in Odonata population dynamics across the UK

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Abstract:
A major task in ecological studies is to account for the various sources of uncertainty that occur at different spatial and temporal scales to provide a more accurate description of how biodiversity responses are affected by environmental changes (Cressie, *et al.*, 2009). However, this is not an easy task and very often ecological data are prone to an observational error induced by the species imperfect detection. Over the last decade, the increasing awareness of accounting for species imperfect detection in ecological studies has led to the development of different species distribution models (Elith and Leathwic, 2009; Devarajan *et al.*, 2020). Particularly, dynamic occupancy models have proven to be a powerful tool to estimate temporal changes in species occurrences by incorporating populations' extinction and colonization dynamics while accounting for false absences (Rushing, *et al.*, 2019). Thus, in this work, we propose a multiple species flexible dynamic model that incorporates a non-linear effect on the colonization and survival dynamics to estimate Odonata occupancy patterns in waterbodies across the UK. Data were provided by Hydroscape (web:hydroscapeblog.wordpress.com), a project investigating how anthropogenic stressors and connectivity interact to influence biodiversity in UK freshwaters. We discuss issues regarding study designs and new approaches to modelling and collection of new data.

Key words: Detectability, Colonization, Flexible Model, Occupancy, Survival

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