ONE Planet Doctoral Training Partnership

Natural Environment Research Council

Project title: Mitigating the impacts of artifical light at night on biodiversity and attractiveness to disease carrying insects

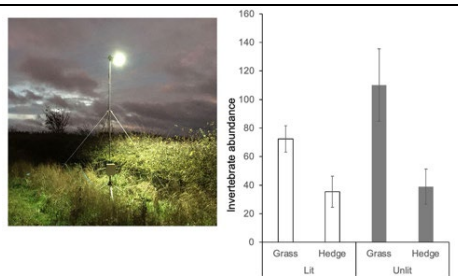
Ref: OP2427

Keywords: plant-animal-disease networks; molecular ecology; biodiversity conservation

One Planet Research Theme:
Climate & Climate Change ☐ | Earth System Processes ☐ | Anthropocene ☒ | Environmental Informatics ☒

Lead Supervisor: Prof. Darren Evans, Newcastle University

Key Research Gaps and Questions:
1) How does artificial light at night (ALAN) affect plants, animals, and the wider ecological networks in which they interact?
2) What are the consequences of ALAN on networks and ecosystem function?
3) Can the impacts of street and domestic lighting be mitigated via management and/or alternative technology?



Experimental rigs (L) used for mitigtion testing, with significant effects on insects (R)

Project Description: Street lights are a major source of direct light pollution emissions, and stock has been transitioning to light-emitting diode (LED) technology in many parts of the world, resulting in increases in the blue part of the visible spectrum that is more harmful to biodiversity and human health. The spectral composition of LEDs has also been shown to influence their attractiveness to mosquitos (Wilson et al. 2023), potentially facilitating disease transmission be increasing contact between humans and vectors.

However, LEDs can be modified by adjusting their intensity, spectral output, and other features of both domestic and street light systems (Evans 2023). Thus, there is enormous potential to a) engineer lights to be less attractive to specific insects, whilst b) minimizing their overall impact on biodiversity and the ecosystem processes they underpin, which can be examined using advances in network ecology and molecular biology (DNA/RNA metabacording) (Bellekon et al. 2021, Evans & Kitson, 2020).

This project will build on a decade of research by drawing on the expertise of a consortium of academics (Newcastle, Northumbria, Target Malaria) NGOs (Butterfly Conservation, A Rocha, Arc), government agencies (Defra, Natural England) and Industry partners (Island Roads) who are committed to understanding and mitigating the impacts of ALAN on biodiversity and human health. Light management/technology mitigation (i.e. LED lamp modification) will be tested using experimental lighting rigs (see figure) in paired lit and unlit areas, with a choice of study sites in the UK, Portugal or Ghana. State-of-the-art plant-animal-pathogen networks will be constructed and compared, with results communicated to lighting industry partners and national and international policy-makers.

References: Wilson *et al.* 2023 DOI: 10.1002/ece3.9714; Evans 2023 DOI: 10.1098/rstb.2022.0355; Bellekon *et al.* 2021 DOI: 10.1016/j.pt.2020.12.001; Evans & Kitson 2020 DOI: 10.1016/j.cois.2020.01.005

Prerequisites: Numerate student wanting to combine advanced theoretical and empirical ecology to address a global challenge. Must be willing to work cross-culturally with periods of fieldwork overseas. Experience of insect trapping and identification desirable.

For more information, please contact Prof. Darren Evans (darren.evans@ncl.ac.uk).

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