Ticks and Lyme disease risk in urban greenspace in northern UK

Jess Hall[1], Grace Plahe[2], David Johnson [3], Richard Birtles [2] , Lucy Gilbert [1]

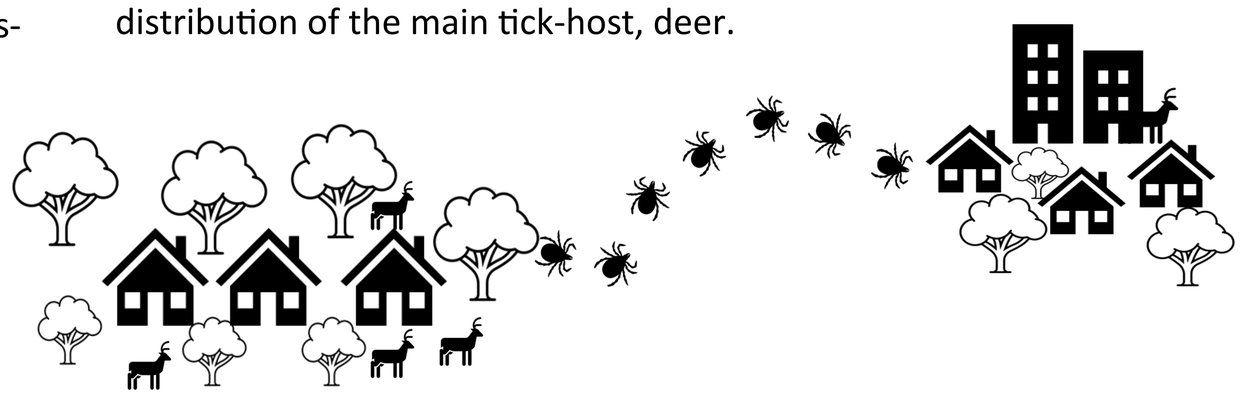
[1]School of Biodiversity, one Health and Veterinary Medicine, University of Glasgow, [2] School of Science, Engineering and Environment, University of Salford, [3] Earth and Environmental Sciences, University of Manchester

INTRODUCTION

Ticks and tick borne disease are ecosystem disservices. Lyme borreliosis (LB) is the most common tick borne disease in the northern hemisphere. Reports of ticks being found in urban environments are increasing as the wildlife domestic interface increases. Complex ecosystems must be in place for LB to be an environmental hazard. The causative agent of LB, *Borrelia burgdorferi sensu lato* has many reservoir host and the main European vector for Lyme borreliosis, *Ixodes ricinus,* has deer as its reproductive host. Understanding what ecosystems support LB in the urban environment is essential to mitigate the risk.

STUDY AIMS

Our aim is to understand how green space management policies and surrounding landscape context affect the density of ticks through the distribution of the main tick-host, deer.



RESULTS

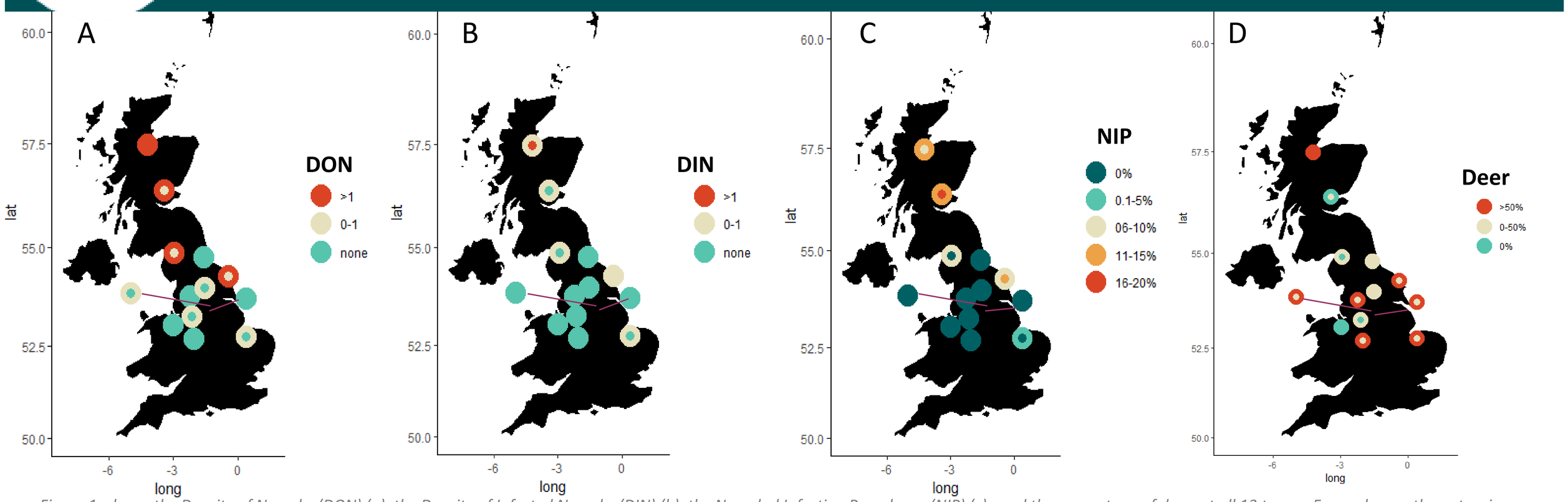


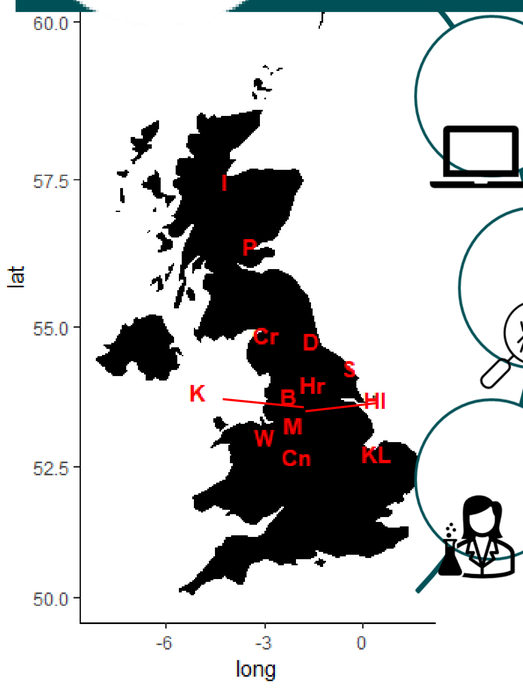
Figure 1: shows the Density of Nymphs (DON) (a), the Density of Infected Nymphs (DIN) (b), the Nymphal Infection Prevalence (NIP) (c), and the percentage of deer ,at all 13 towns. For each map the outer ring signifies the mean in the rural sites and the inner circle signifies the mean in the urban sites.

Factor	Estimate	Std. Error	Z-Value	P-value
Intercept	-3.828847	2.006215	-1.908	0.05633
Urban	-2.997139	0.638381	-4.695	**2.67e-06**
July	3.213397	1.098483	2.925	**0.00344**
June	-1.583055	1.294537	-1.223	0.22138
Temp	0.057161	0.114432	0.500	0.61741
Vegetation height	-0.017550	0.005671	-3.095	**0.00197**

Table 1 shows the summary of a Generalized linear mix models exploring the factors affecting nymphs in the environment. This was performed on a subset of data including towns where ticks were present in at least the rural environment.

We found ticks in urban locations at four out of 13 towns, with significantly lower tick densities in urban green spaces than in rural woodlands (Table 1). The environmental hazard of *Borrelia* infected nymphs in urban areas was 0 in most towns with the exception of two towns (one being Inverness!, fig1b). The infection prevalence was higher on average in urban green spaces than in rural woodlands, but this may be due to small sample sizes. As shown in fig 1b, the hazard/ DIN is only higher in two towns in the urban green spaces than the rural woodlands surrounding the towns. We quantified deer at all the sites and deer were significantly less likely to be found in an urban environment than rural woodlands (Z–value –3.636, P-value 0.0002).

METHODS



13 towns of 50,000-100, 000 inhabitants. Chose 5 Urban and 5 rural sites

At each site, drag for ticks, quantify deer dung, measure habitat factors.
(May – Sept 2023)

Extract nymphs, PCR for *B. Burgdorferi* using of 5S/23S rDNA intergenic spacer regions

FURTHER WORK

- 2023 survey - return to sites with ticks in the urban green spaces and add some additional sites.
- Gain more accurate data on deer by local knowledge of deer numbers.
- Analyze 2022 & 2023 data together to get more power to draw conclusions.

For more on the *Borrelia* genospecies diversity see poster P3 and Grace Plahe

The University of Manchester · University of Glasgow · University of Salford Manchester · Natural Environment Research Council