Assessing effects of landscape and woodland patch attributes on the density of *Ixodes ricinus* within woodland creation sites in Scotland

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Abstract

Tick-borne zoonoses are an increasing threat to the health of people and livestock in northern latitudes, and this could be exacerbated by policy driven increases in woodland cover. Diseases such as Lyme borreliosis (LB), a tick-borne bacterial disease caused by infection with *Borrelia burgdorferi* sensu lato, cause tens of thousands of infections in Europe annually, with increased infections recorded year-on-year. The primary vector of LB is *Ixodes ricinus* L., a tick species common in woodland habitats. However, little is known about how tick-borne disease risks will change in the future as planted woodland patches increase in size, complexity, and connectivity. Additionally, how host species assemblages establish over time in UK woodlands remains poorly understood. We predicted that increasing woodland connectivity and reducing the distance between patches will favour patch utilisation by host species such as deer which are important for presence and density of *I. ricinus*. More complex woodland structures found in older woodlands could favour small mammal populations, which are transmission hosts for *B. burgdorferi* s.l. and more suitable ground vegetation conditions could increase off-host tick survival through increasing humidity. To investigate this, a snap-shot survey of 60 broadleaf woodlands in Scotland selected along gradients of patch size, connectivity and woodland age was conducted between June and July 2023. *Ixodes ricinus* nymphal density, ground vegetation, temperature and humidity were measured along twenty 10m transects in each woodland, and an hour of constant dragging was carried out to collect additional nymphs. Out of 60 woodlands, 32 were found to have populations of *I. ricinus* where the tick population appeared to be established (>6 nymphs collected from site), while the remaining 28 sites were found to have very low or absent tick densities (<6 nymphs). In sites where *I. ricinus* was present, mean nymph densities ranged between 0.26 (±0.55) and 4.15 (± 2.90) nymphs/10m^2. Generalised linear mixed models were used to determined how woodland age, size, connectivity, and vegetation could influence i) the presence or apparent absence of *I. ricinus* populations at a site and ii) the density of nymphs recorded on individual

transects nested within sites. Results from this study could be used to inform woodland managers and users about the risk from tick-borne pathogens and how these risks could change over time.