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Using citizen science to improve the knowledge of tick distribution in Scotland

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Print publication: 03/12/2018

Document Version

Publisher's PDF, also known as Version of record

[Link to publication](#)

Citation for published version (APA):

Ribeiro, R., Eze, JI., Gilbert, L., Gunn, GJ., Macrae, A., Duncan, A., ... Auty, HK. (2018). *Using citizen science to improve the knowledge of tick distribution in Scotland*. Poster session presented at VECTOR-BORNE DISEASES IN THE UK (VBD2018), Norwich, United Kingdom.

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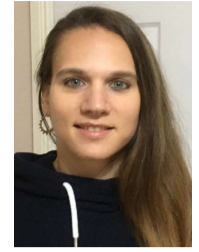
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Using Citizen Science to Improve the Knowledge of Tick Distribution in Scotland

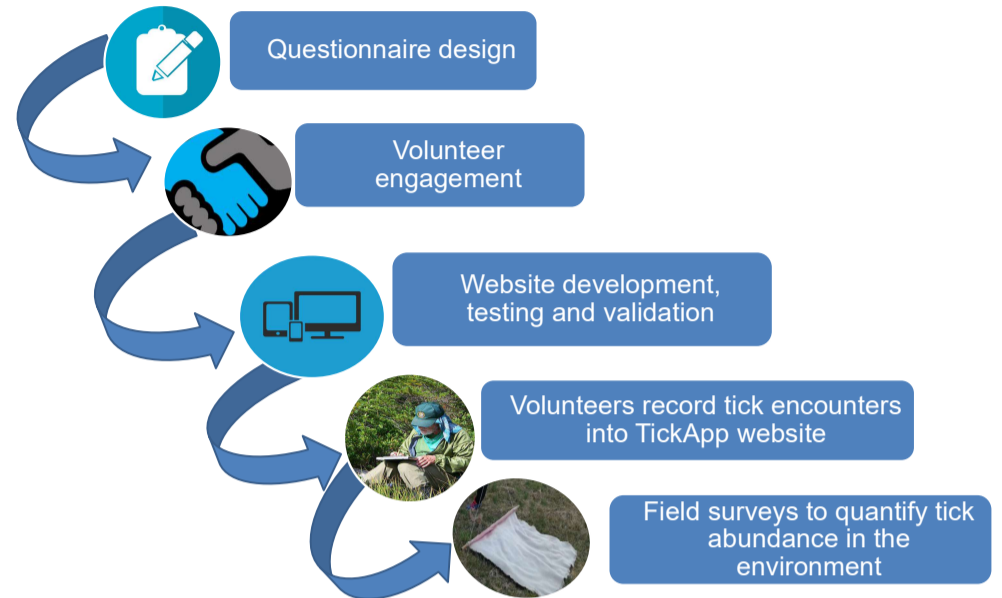


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Introduction: The tick *Ixodes ricinus* is widely distributed throughout Europe and is responsible for the transmission of important pathogenic agents to humans such as *Borrelia* species that cause Lyme disease. Information about the rates at which people encounter ticks in the environment would be valuable in helping to understand how to reduce the risk of tick-borne diseases [1], but these data are rarely collected. Citizen science, the term used to describe the engagement and active participation of non-professionals in scientific investigations [2], could provide a valuable way of improving data collection on tick bite risk.

The objective of this study is to develop and conduct a citizen science study to estimate the rate of human-tick encounters, map human-tick encounter rates and compare the results with tick abundance estimates from surveys counting ticks in the environment.



Results:

The website opened on 1st June 2018 and will close on 31st October 2019 (it was temporarily closed over winter). So far, 1613 entries were made by project volunteers. From these records, 210 reports had ticks and 1403 reported no ticks. Volunteers reported a total of 458 ticks crawling and 438 attached (out of total of 210 reports with ticks). In total these reports came from 56 volunteers, who reported data over Scotland (two of which were outdoor centres responding on behalf of groups). Organisations such as outdoor centres and the Scottish Orienteering Association were engaged to improve routine reporting.

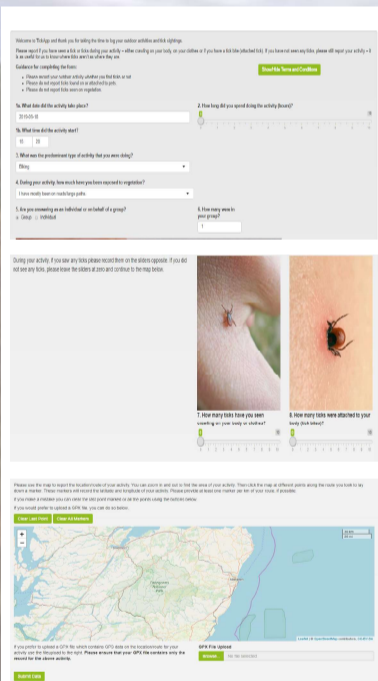


Fig 1: Screenshots of the "TickApp" website.

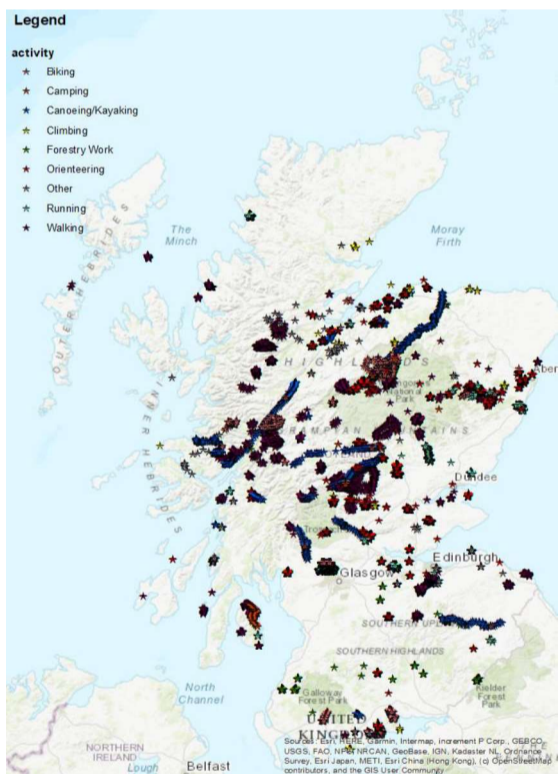


Fig 2: Map of Scotland with data recorded into TickApp website. Points represent the trajectories reported by volunteers (reported as GPX file or drawn on a map) and are coloured according the type of activity.

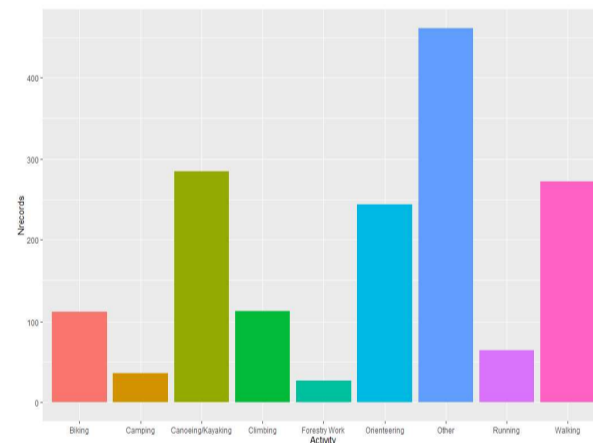


Fig 3: Bar chart showing the number of reports ranked by activity.

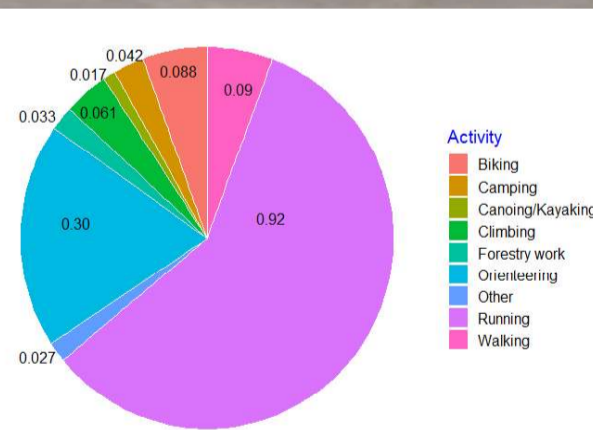


Fig 4: Pie chart of preliminary data showing the average of ticks reported per person and per activity. Please note, the risk of encountering ticks is influenced by many factors, including the location, vegetation type and the time of year, so these preliminary data should not be used to suggest that one activity is more 'risky' than another.

Discussion and conclusions:

- ✓ To estimate the risk of human-tick contact and of tick bite, volunteers are asked to report the number of ticks crawling on their body and/or the number of tick bites. The distance covered and the time spent during an outdoor activity are used as possible denominators for the count of ticks.
- ✓ Tick absence during an outdoor activity is also recorded as volunteers are encouraged to report activities routinely, not only when ticks were observed.
- ✓ The results of this pilot study so far suggests that people can successfully report ticks and tick absence by following this scheme.
- ✓ Future analysis will include complex statistical models for the rate of human-tick contact which will be corrected for errors and bias including volunteer variability and effort, seasonal and temporal effects.
- ✓ The results of this project will help to provide better and more up to date information on tick-human encounters and how they vary with different geographical areas, habitats and times of year.

Bibliographic references: [1] Hall JL, Alpers K, Bown KJ, Martin SJ, Birtles RJ. Use of mass-participation outdoor events to assess human exposure to tick borne pathogens. *Emerg Infect Dis* [Internet]. 2017 [cited 2018 Jun 19];23(3):463–7; [2] Miller-Rushing, A., Primack, R. & Bonney, R. The history of public participation in ecological research. *Front. Ecol. Environ.* 10, 285–290 (2012).
Acknowledgments: To all volunteers reporting data! Many thanks for all contributions.

