



## **Reducing tick bite risk in Finland – combining citizen science and GIS for predictive modelling of tick occurrence**

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Ticks (Acari: Ixodidae) and tick-borne diseases constitute a growing welfare problem in northern Europe and Russia. Surveys conducted in Russia, Sweden and Norway have revealed a northwards shift in distribution and an increase in tick abundance over the past few decades. In southwestern Finland, surveys have revealed a similar increase in tick abundance, as well as the presence of novel tick-borne pathogens. As avoiding risk areas and removing attached ticks as quickly as possible are the best available methods for preventing tick-borne diseases, accessible and up-to-date data on tick occurrence is essential. However, consistently tracking the nationwide distribution of ticks is impossible using traditional collection methods. Therefore, GIS-based predictive modelling for tick occurrence is required.

In May 2015, a national tick collection campaign was launched by the University of Turku tick project, with the objective of mapping the current geographical distribution of the two tick species responsible for tick-borne infections in Finland, *Ixodes ricinus* and *Ixodes persulcatus*. During the collection campaign, citizens were asked to send any ticks they found to the University of Turku by letter, along with information on the collection locality. The campaign ended in September 2015 and was a great success, with nearly 7000 letters delivered to the University. These letters contained more than 20 000 individual ticks from all around Finland. The geographic data from the letters was converted into coordinate points after the campaign was concluded.

Data from the national tick collection campaign revealed not only a northwards shift in the distribution of *I. ricinus*, but also novel foci for *I. persulcatus* in Finland. Strikingly, while they were otherwise found throughout Finland, *I. persulcatus* were absent from the south-southwestern coast, where *I. ricinus* is nevertheless abundant. The exact cause for this phenomenon is unclear, as *I. persulcatus* are found further south in nearby Estonia and Russia.

Using the location and tick species data from the collection campaign, as well as nationwide data sets regarding several different environmental factors (e.g. temperature sum, soil type), we seek to identify potential environmental causes for the realized geographical distributions of these two tick species in Finland. Particularly, we seek to identify factors limiting tick occurrence in certain areas, especially *I. persulcatus* occurrence in southern Finland. The ultimate goal is to determine whether quantifiable environmental factors linked to tick occurrence can be found, and, if found, use them to apply GIS models to map and predict changes in tick distribution in Finland.

In the poster presented here, we showcase the methodology used in assessing effects of different environmental factors on tick occurrence, and present preliminary results from GIS analysis of coordinate, tick species and environmental data.