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Publication date: 2016

Document Version Publisher's PDF, also known as Version of record

Link back to DTU Orbit

Citation (APA):

Cuellar, A. C., Schou, K. K., Moutailler, S., Fach, P., Delannoy, S., van der Wal, F. J., ... Bødker, R. (2016). Predicting spatial prevalence of tick pathogens in Northern Europe using satellite imagery. Poster session presented at SVEPM, Helsingør, Denmark.

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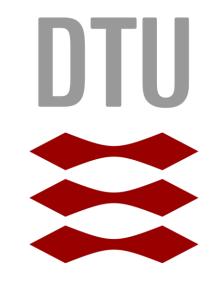
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# Predicting spatial prevalence of tick pathogens in Northern Europe using satellite imagery

Ana Carolina Cuellar <sup>1</sup>, Kirstine Klitgaard Schou<sup>1</sup>, Sara Moutailler<sup>2</sup>, Patrick Fach<sup>2</sup>, Sabine Delannoy<sup>2</sup>, Fimme van der Wal<sup>3</sup>, Aline de Koeier<sup>3</sup>, Jan Chirico<sup>4</sup>, Anna Aspán<sup>4</sup>, Mikael Juremalm<sup>4</sup>, Karen Mansfield<sup>5</sup>, Paul Phipps<sup>5</sup>, Tony Fooks<sup>5</sup> and Rene Bødker<sup>1</sup>

<sup>1</sup> National Veterinary Institute- Technical University of Denmark, Section of Epidemiology, <sup>2</sup> French Agency for Food, Environmental and Occupational Health & Safety- France, <sup>3</sup>Central Veterinarian Institute-Wageningen University- Netherlands <sup>4</sup>National Veterinary Institute- Sweden, <sup>5</sup>Animal and Plant Health Agency (APHA) - United Kingdom

# Background

- Spatial distribution of ticks and the pathogens they transmit is a key tool to assess human risk for tick borne diseases
- Tick pathogens are related to the presence of suitable hosts which depend on environmental factors
- We hypothesis therefore that the spatial prevalence can be modelled using predictors variables obtained from Earth Observation satellites (Big Data).

# **Objectives**

- To model the probability of presence of different ticks pathogens in five European countries using environmental variables extracted from satellite imagery
- To map the probability of presence of ticks pathogens
- To analyze if the probability of presence its correlated to the ticks pathogen prevalence

## Methods

Machine Learning

modelling

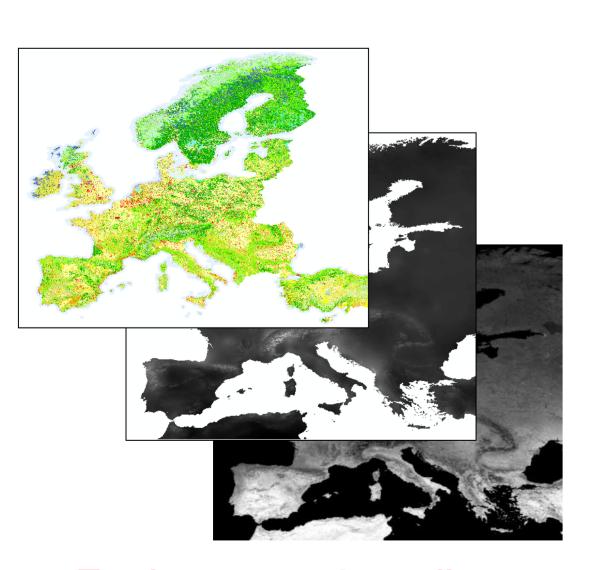
Random Forest

Data collection: pools of 25 Ixodes ricinus

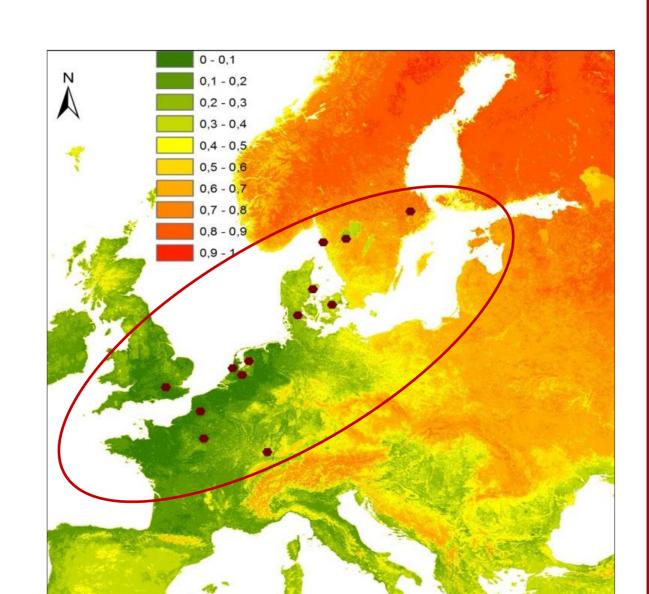
nymphs from 13 sites (England, France,

Netherlands, Denmark, Sweden)

Observed prevalence of tick pathogens



Environmental predictors from satellite imagery



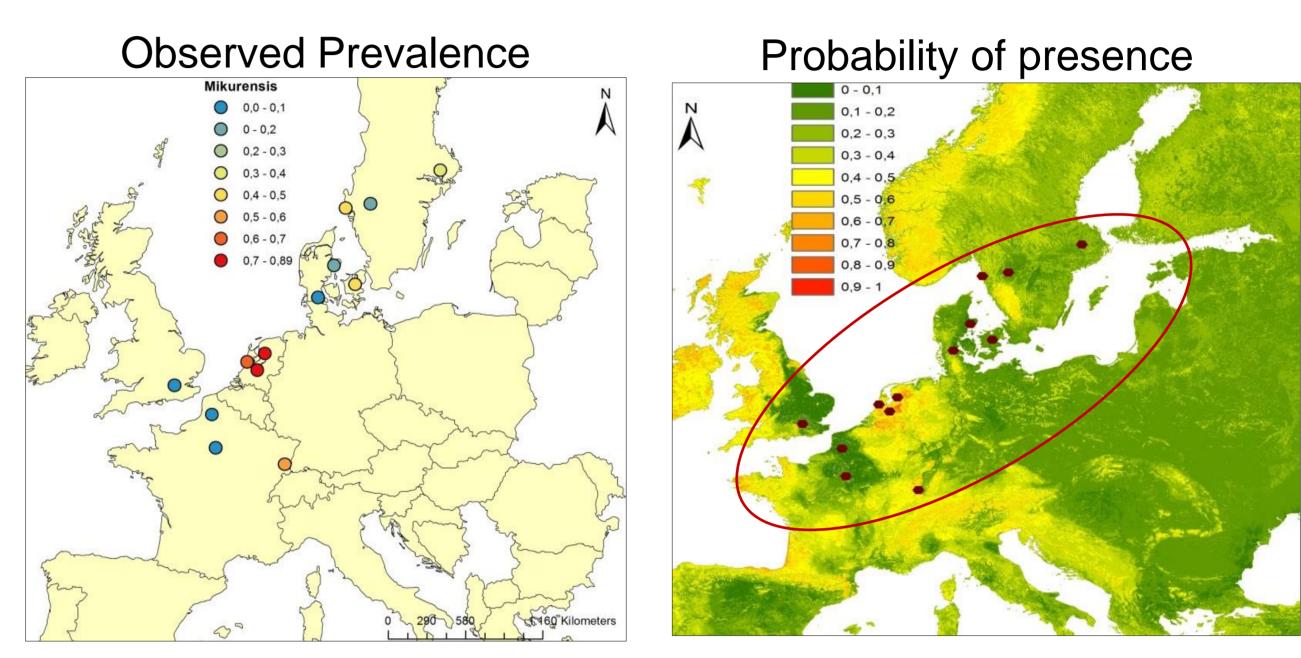
Probability of presence map

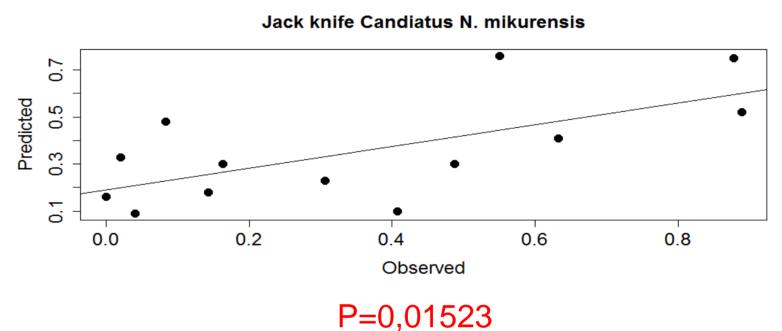
Model validation: Jackknife

### Results

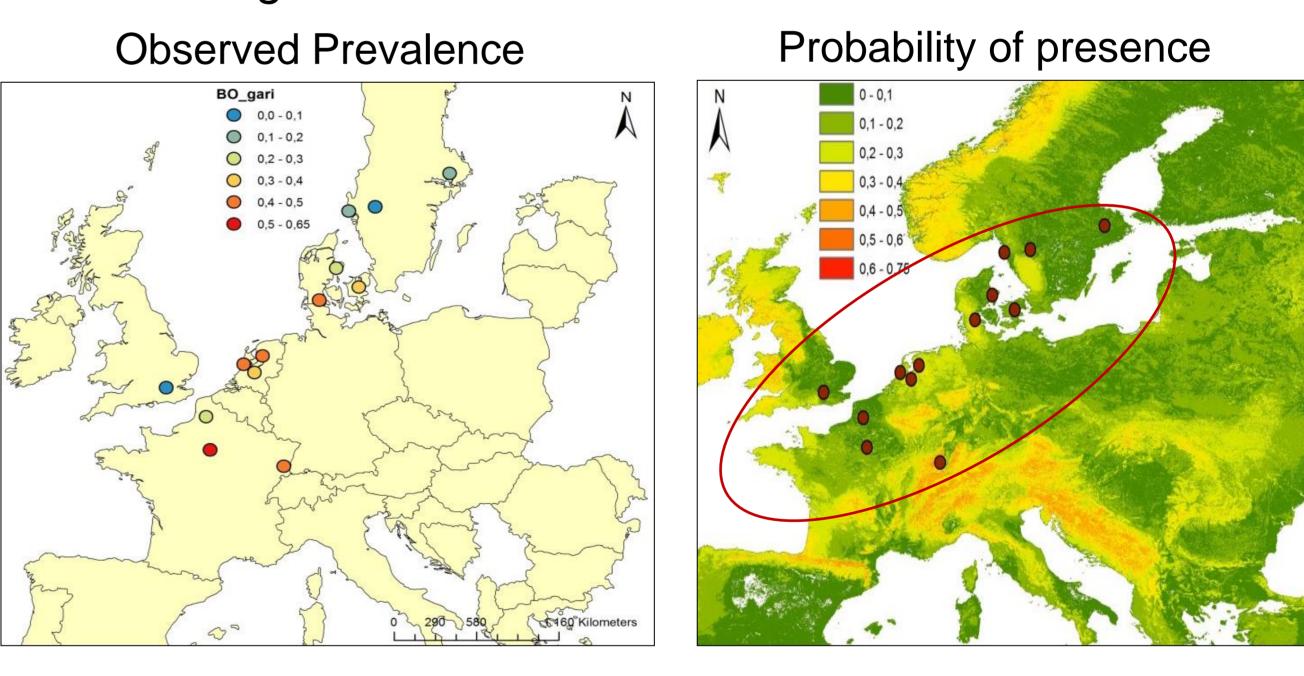
The model was significant for 2/7 of the species.

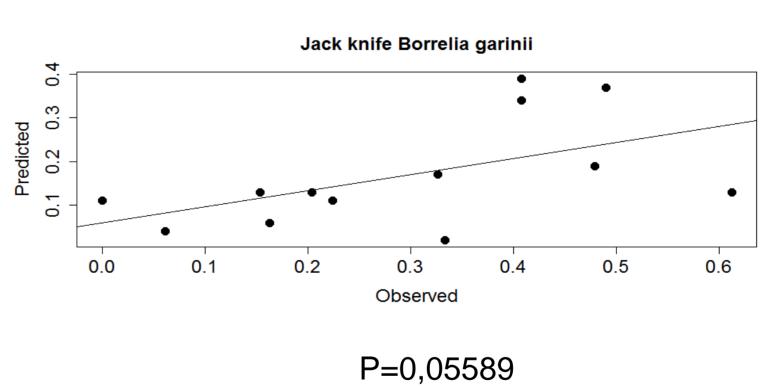
Candidatus Neoehrlichia mikerensis





### Borrelia garinii





### Conclusion

- Pathogen prevalence differed between sites
- Observed prevalences fit the environmental data
- It is possible to predict and model spatial variation in prevalence of some tick-borne pathogens

**DTU VET National Veterinary Institute Section for Epidemiology** 

Bülowsvej 27

1870 Frederiksberg C

**Ana Carolina Cuellar** PhD student

Corresponding author:

Phone: +45 71 61 98 22

Email: anacu@vet.dtu.dk

