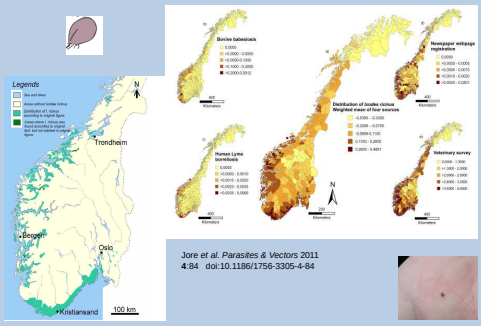
Changing farming, bush encroachment, and tick-borne diseases in Southern Norway

Sophie Vanwambeke & J. Van doninck, J. Artois, P. Meyfroidt, S. Jore*

** Norwegian veterinary Institute & Public Health Institute, Oslo*

Context:

→known distribution of ticks in Norway increases



Methods

→map spatio-temporal dynamics of bush encroachment in southern Norway

Long time series of Landsat processed as
- forest fractions
- land cover maps (=classes)
- changes

Land cover ≠ land use

Challenges – to this context and to others
- Gradual land cover changes
- That need to be aggregated

→tick distribution informed indirectly… diversify sources

Study 1: climate and environmental factors driving *I. ricinus* expansion

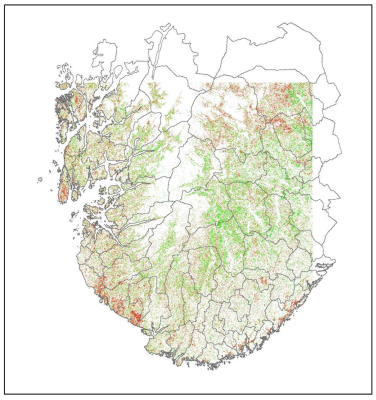
- Sheep serum samples covering a 30-year span (*A. phagocytophilum*)
- Climate factors (met station derived)
- Host abundance (bag data)
- Land cover change: basic assessment of bush encroachment
- Land use (sheep, number of farms)

Results
- Climate: temperature fluctuation, precipitations, snow days, relative humidity
- Hosts: Red deer (*Anaplasma* reservoir?)
- Land cover: number of encroachment patches, mean area
- Land use: density of livestock farms

→ Jore et al., 2014, *Parasites & Vectors* **7**:11 doi:10.1186/1756-3305-7-11

In the absence of extensive, dynamic tick data: need for indirect indicators

- Sheep serologies (temporal depth – *study 1)*
- Lyme borreliosis cases (temporal depth, spatial extent, low res – *study 2*)
- Field collection (no temporal depth, high spatial res)

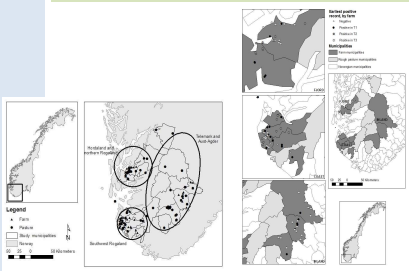


An RBHC perspective on this problem…

Tick **functions** … and associated **resources**… and associated land cover/land use

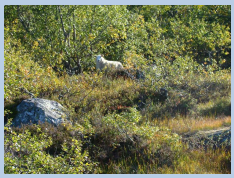
Questing	Grassy or bushy vegetation
Reproducing/egg-laying	Litter/moist soil (forest - not on slopes or rocky susbstrate?)
Diapause (various)	Litter/moist soil
Feeding	Hosts: Domestic mammals , wild mammals

Tick movement range? Very restricted (except on hosts)



Context: landscape dynamics

- Bush encroachment, as in other marginal areas of Europe
- Decrease in the number of farms
- Spatially heterogeneous



Preliminary results : land cover change study

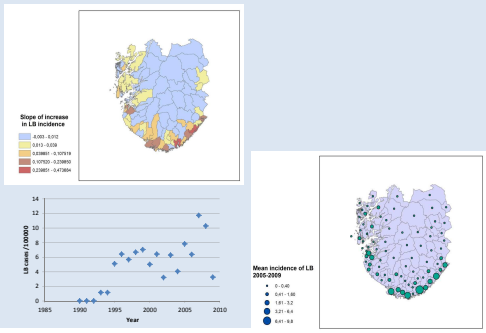
(panel analyses→focus on change)

Mean forest fraction increases where pastures (census) decreases

More pixels have an important increase in forest fraction where fields decrease

Study 2: Incidence of Lyme borreliosis by municipality (in progress)

→broader coverage
→same temporal depth (?)
→coarser resolution



Conclusions: methodological challenges…

- Comparison of continuous vs. categorical data
- What is the population at risk?
- Tick indirect information at various resolutions (point, pasture, rough grazing, municipality) and extents
- RBHC should include pathogen used as proxy
- Temporal depth?