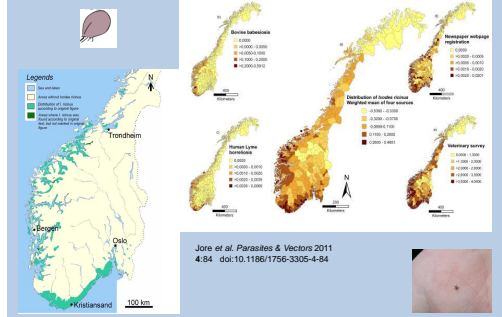


Sophie Vanwambeke & J. Van doninck, J. Artois, P. Meyfroidt, S. Jore\*  
 \* Norwegian veterinary Institute & Public Health Institute, Oslo

**Context:**

→ known distribution of ticks in Norway increases



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)

**Context: landscape dynamics**

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



**Methods**

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

Long time series of Landsat processed as

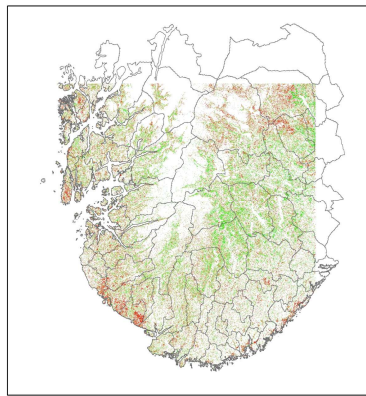
- forest fractions
- land cover maps (=classes)
- changes

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



**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 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*

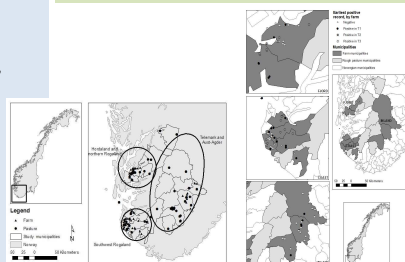
7:11 doi:10.1186/1756-3305-7-11

**An RBHC perspective on this problem...**

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

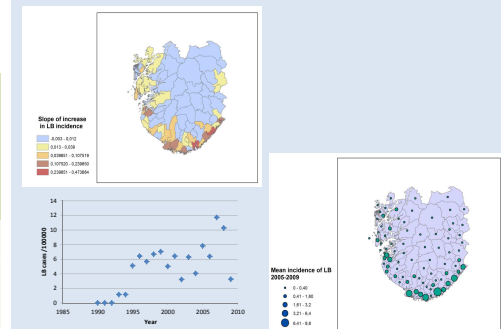
Questing	Grassy or bushy vegetation
Reproducing/egg-laying	Litter/moist soil (forest - not on slopes or rocky substrate?)
Diapause (various)	Litter/moist soil
Feeding	Hosts: Domestic mammals, wild mammals

Tick movement range? Very restricted (except on hosts)



**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?