

Spatial distribution and risk factors of clinical leptospirosis in cattle based on Micro Agglutination Test results, a survey in France (2015-16)



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Background

The concern of bovine leptospirosis relies on number of infection in farmers and economic losses. Leptospirosis occurrence and the related cost are underestimated in cattle because clinical forms (abortion, fever, reduced milk production) are unspecific and can be confused with other causes of reproductive disorder (e.g., Brucellosis, IBR)

Objectives

To guide veterinary practitioners and to support *Leptospira* suspicion in cattle herds by determining risk factors of (sub)clinical leptospirosis in France.

Materials and Methods

Micro agglutination tests (MAT) results included were performed at the Veterinary Reference Laboratory for *Leptospira* diagnosis (Laboratoire des Leptospires) and recorded between 2015 and 2016.

Infected herd definition: combined the maximum MAT titer (1:100, 1:200 or 1:400) and the proportion of seroreaction (50%, 25% or unique sample respectively) among tested individuals in the herd.

Case control study: Farmers from 58 case (among 215 positive herds) and 59 control farms (no seroreactivity) were randomly selected and interviewed by phone survey to collect 42 zotechnical and 3 environmental variables.

Selection of independent covariates:

Simple Logistic Regression analysis (p value < 0.05)

Correlation test (Coef. > 0.7 and p value < 0.05)

Priorization of covariates:

Boosted Regression Trees (BRT) analysis using {gbm} package

Multivariate Logistic Regression Models

performed with R Development Core Team (v 3.3.2)

Results

Two areas with a higher number of occurrences and not related with the highest herd density areas, have been identified in the West and the Centre-East (Fig. 1).

BRT results suggest a strongest association between infected herds and presence of nutria (*Myocastor coypu*). The Ranking of the eight other variables were not robust (Fig. 2).

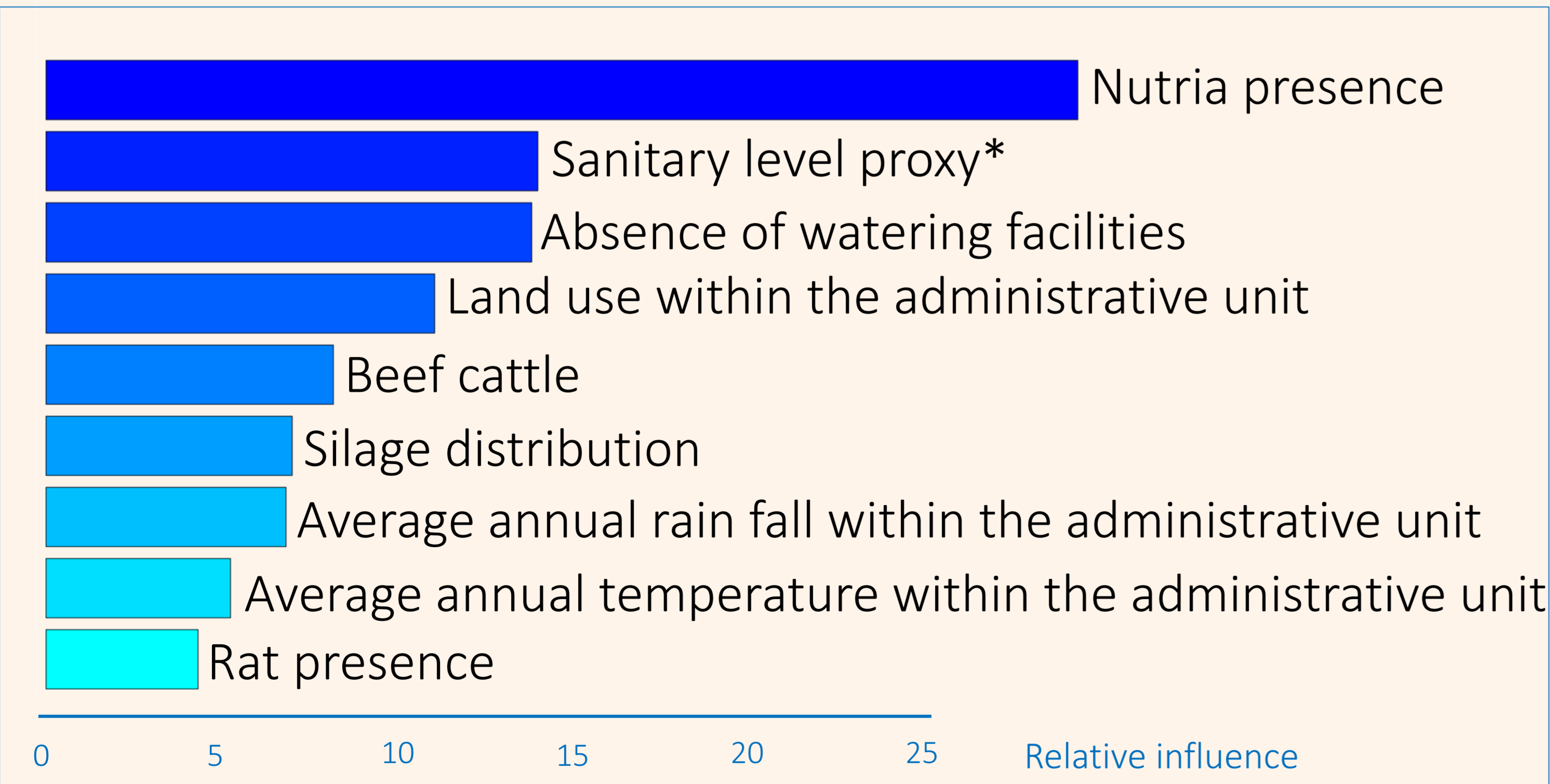


Figure 2: Boosted Regression Trees output. *number of veterinary intervention per month.

The first model included watering facilities and feeding covariates (hay, silage, pellets). The second model included housing, nutria and rat presence and sanitary level covariates.

Model 1, the ORs of being infected were significantly lower in farms feeding with silage (OR=0.3, CI_{95%}[0.1-0.7]) and greater in absence of watering facilities (OR=6.8 CI_{95%}[2.9-16]).

Model 2, the OR of being infected was greater in farms housing cattle in straw yards (OR=10.8 CI_{95%}[1.8; 62.7]), when nutria presence was reported (OR=39 CI_{95%} [7; 225]) and increased with the decreasing sanitary level proxy of the farm (OR=4.7 CI_{95%} [1.6; 14]).

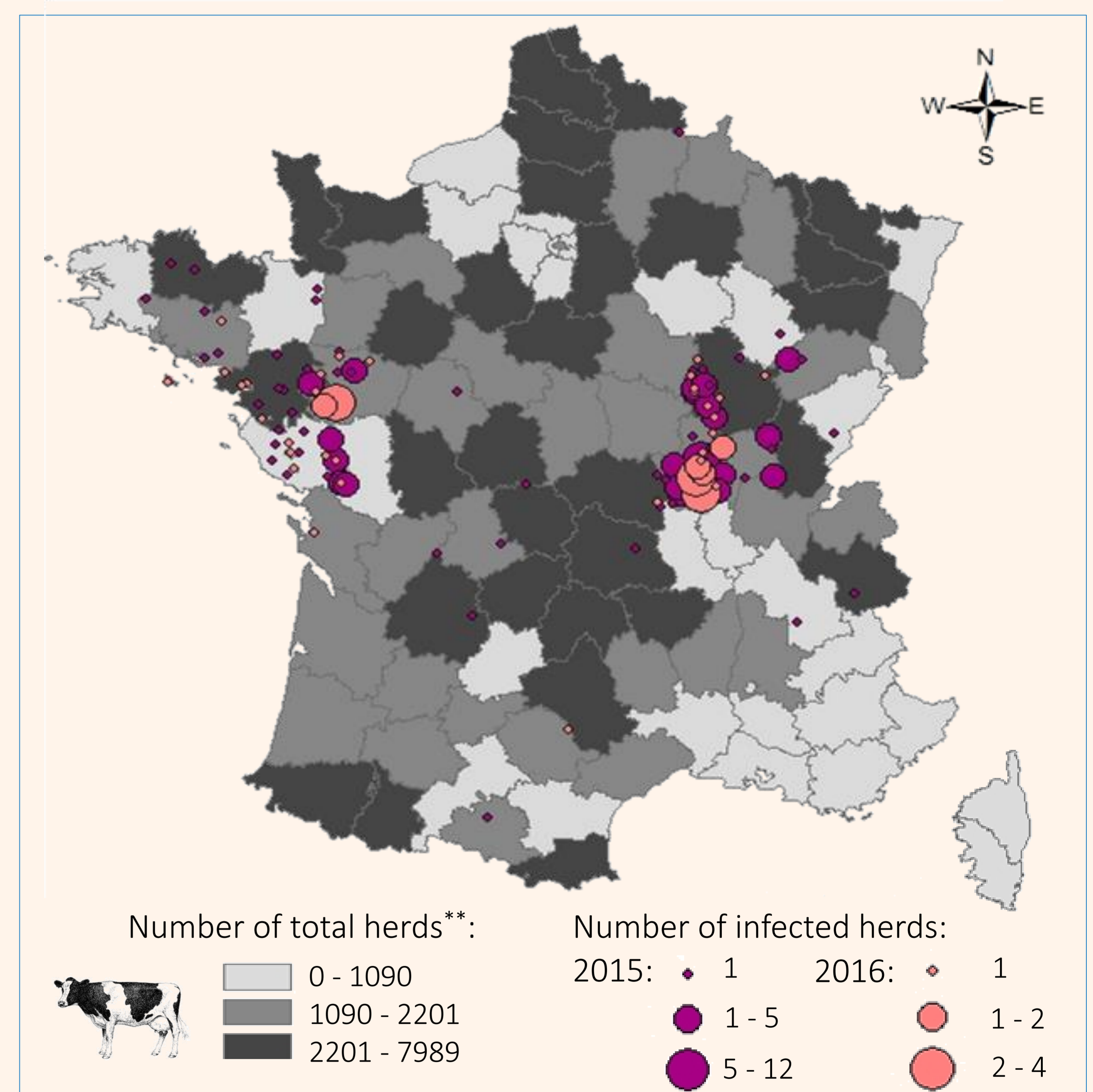


Figure 1: Spatial distribution of leptospirosis occurrence risk in cattle and herd density (mapped using the farm address and Arc GIS®).

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Discussion and conclusions

The spatial distribution of infected herds was consistent with the distribution of occurrences obtained in the previous years and suggests **at-risk areas** in France. The veterinary practitioners working in these areas should be aware of the epidemiological situation.

Presence of **nutria** reported to be a major *Leptospira* carrier, **absence of drinking facilities** that promotes access to water potentially contaminated by infected wildlife, **straw yards** that lead to increased proximity between congeners and potential *Leptospira* transmission and farms with **low sanitary level** should be considered to guide veterinary practitioners and to support *Leptospira* suspicion.