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First serological evidence of Q fever circulation in ruminant herds in French Guiana

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BACKGROUND

- High incidence of human Q fever in French Guiana.
- Incomplete knowledge about animal reservoir(s) of this bacterial zoonosis in a singular hyperendemic area.
- Presence of a sheep farm within 5 km is an exposition risk factor for human seropositivity in the department*.

*Flamand C, in press

OBJECTIVES

- Seroprevalence assessment of Q fever in ruminant herds in French Guiana
- Determine whether domestic ruminants may play a role as animal reservoir in the department

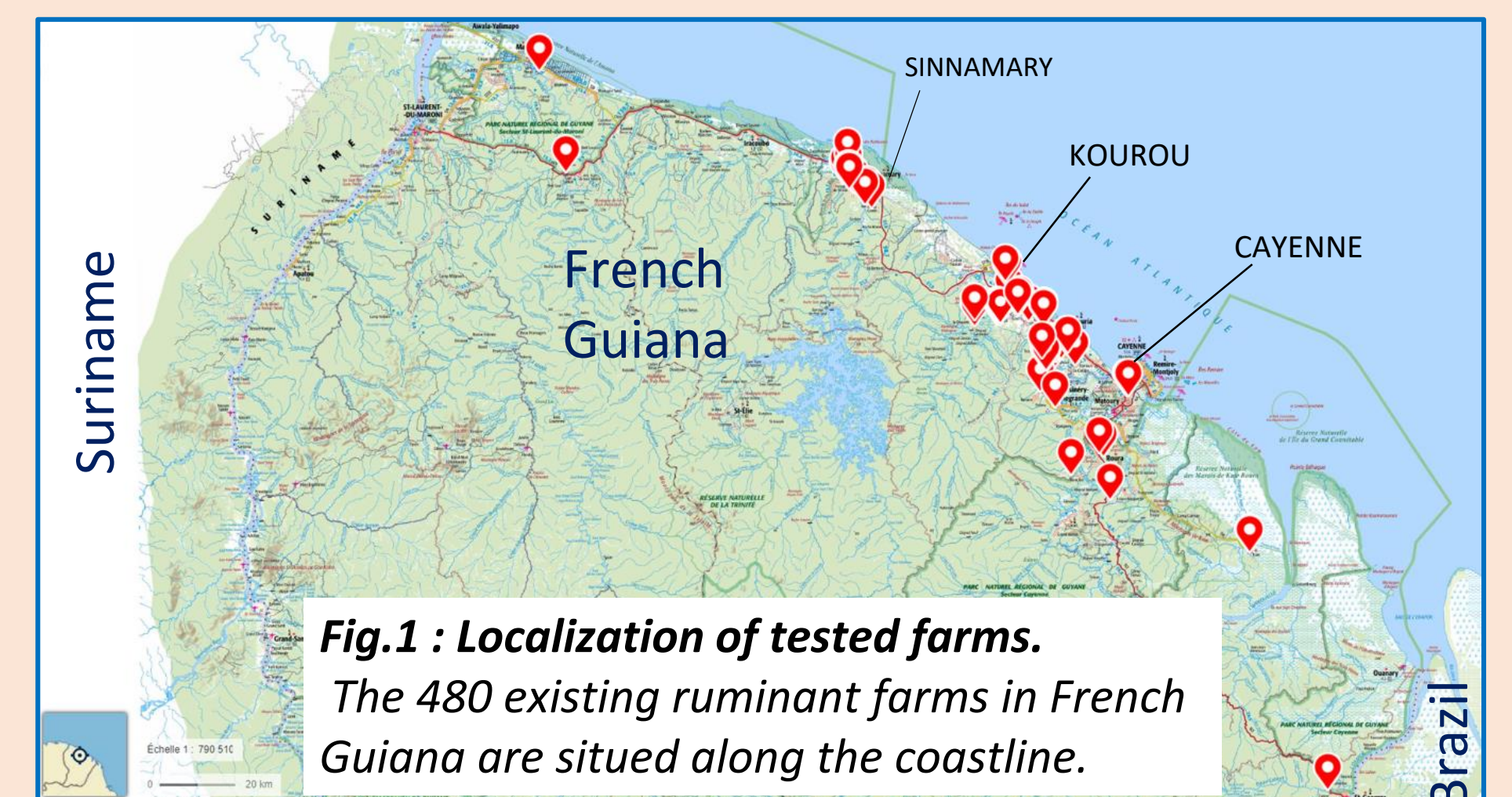


Fig.1 : Localization of tested farms.
The 480 existing ruminant farms in French Guiana are situated along the coastline.

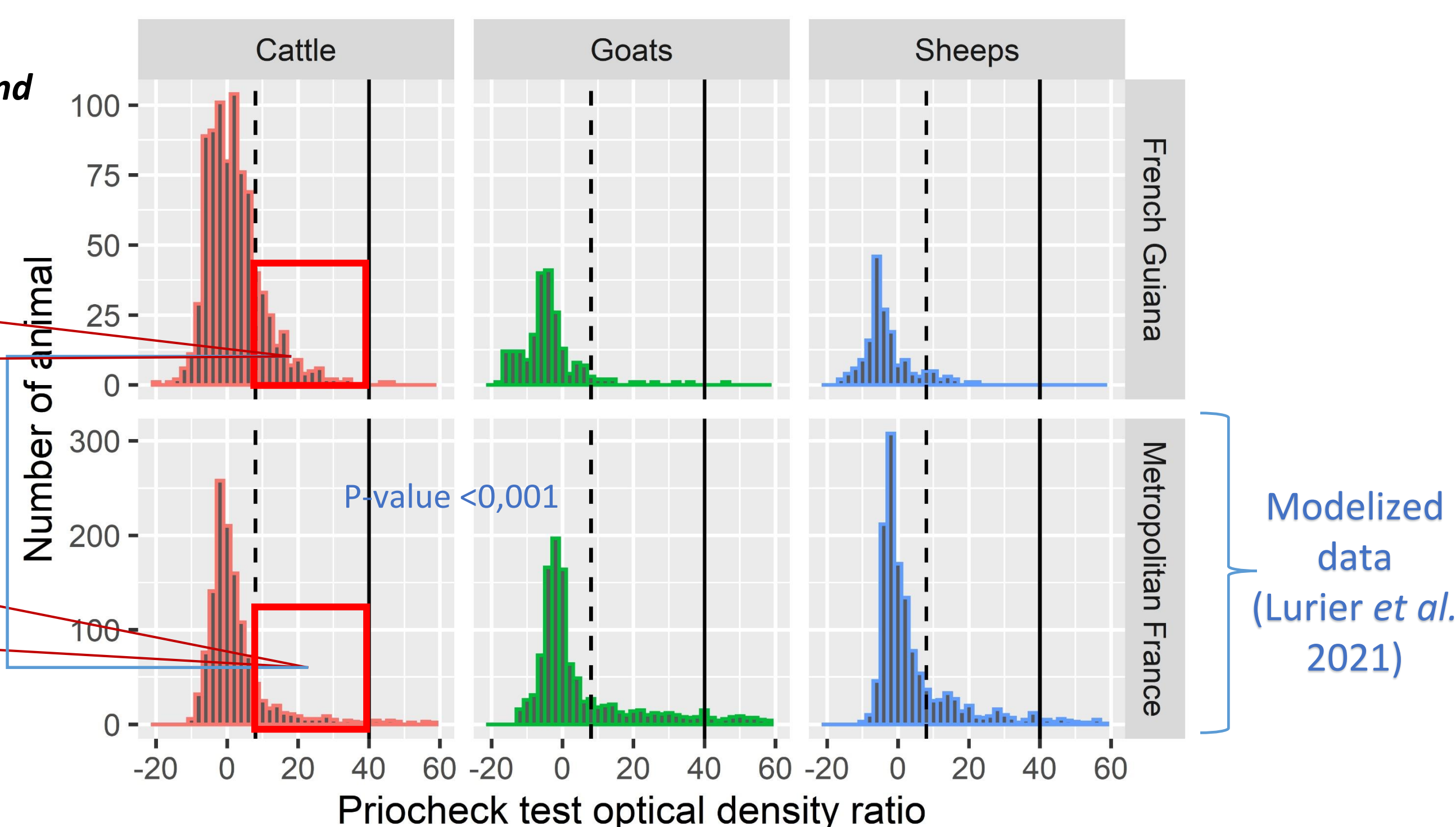
MATERIAL & METHODS

- **Sampling** : Blood from 834 cattle, 219 goats and 175 sheeps in 86 farms from 2015 to 2017 (over 480) conjointly with brucellosis prophylaxy (DGTM-DEAAF).
- **Analysis method** : Applied Biosystems PrioCHECK Ruminant Q fever Ab Plate Kit (Thermo Scientific™) was used, an indirect ELISA based on Phase I+II whole antigen prepared from an ovine strain isolated in metropolitan France. Analysis setting up and performances were verified in collaboration with Q fever NRL.
- **Statistical analysis** : Prevalence calculation and adjustment with test sensitivity and sensibility values were obtained from modelised metropolitan data**.

**Lurier T, Rousset E, Gasqui P, Sala C, Claustre C, Abrial D, Dufour P, de Crémoux R, Gache K, Delignette-Muller ML, Ayrat F, Jourdain E. Evaluation using latent class models of the diagnostic performances of three ELISA tests commercialized for the serological diagnosis of *Coxiella burnetii* infection in domestic ruminants. Vet Res. 2021 Apr 14;52(1):56. See Poster # 231.

RESULTS

Fig.2 : ODR distribution in ruminants in French Guiana and metropolitan France



- Few positive results regarding Q fever ELISA kit manufacturer's 40% ODR threshold.

- Many results on bovine sera at ODR > 8% and < 40% vs. metropolitan data

⇒ Hypothesis 1 : High ODR from seronegative sera

A background noise and cross reactions with other bacteria species no or less present in metropolitan France

⇒ Hypothesis 2 : Low ODR from seropositive sera

The serological antigenic strain used is not recognized by antibodies produced against *C. burnetii* circulating in Guiana



Sensitivity and specificity estimation setting the threshold at 8% ODR

Reliable Se & Sp values

for Metropolitan France

Species	Sensibility	Specificity
Cattle	0.86 [0.71 ; 0.93]	0.92 [0.9 ; 0.94]
Goat	0.92 [0.87 ; 0.96]	0.95 [0.93 ; 0.96]
Sheep	0.91 [0.83 ; 0.96]	0.92 [0.9 ; 0.94]

Table 1 : Apparent seroprevalence (manufacturer's threshold) and real seroprevalence (according to modelisation)

Year	Species	Number	Number of positives (OD>40%)	Apparent prevalence [CI 95%]	Number of positives (OD>8%)	Real prevalence [CI 95%]
2015	Cattle	275	1	0.4 [0 ; 2.3]	48	13.2 [7 ; 20.3]
	Goat	86	0	0 [0 ; 5.3]	4	0.9 [0 ; 6.7]
	Sheep	46	4	8.7 [2.8 ; 21.7]	6	4.8 [0 ; 19.1]
2016	Cattle	296	2	0.7 [0.1 ; 2.7]	85	28 [20.6 ; 37.5]
	Goat	31	0	0 [0 ; 13.7]	6	16.2 [2.9 ; 35]
	Sheep	62	0	0 [0 ; 7.3]	8	4.4 [0 ; 16.8]
2017	Cattle	263	2	0.8 [0.1 ; 3]	19	0.7 [0 ; 4.9]
	Goat	102	2	2 [0.3 ; 7.6]	5	0.9 [0 ; 6.2]
	Sheep	67	0	0 [0 ; 6.8]	7	2.5 [0 ; 12.7]
2015-17	Cattle	834	5	0.6 [0.2 ; 1.5]	152	14.2 [10 ; 19.4]
	Goat	219	2	0.9 [0.2 ; 3.6]	15	1.8 [0 ; 6.6]
	Sheep	175	6	2.3 [0.7 ; 6.1]	21	3.7 [0 ; 10.8]

Accounting for the Se and Sp at the 8% threshold

CONCLUSION

- First large-scale study of ruminant livestock in French Guiana for Q fever seroprevalence.
- Evidence of a potential important *Coxiella burnetii* exposition, which had not been shown until now:
 - Highest real prevalence in 2016 in cattle and goats. (dotted box in Table 1)
 - 66,3 % of sampled herds have been exposed to *Coxiella burnetii*.
 - Real prevalence estimated at 14,2 % in cattle with confidence interval [10 ; 19,4].
- Differences observed between guyanese data and metropolitan data with higher prevalence in cattle than in goats and sheep in French Guiana

! Phenomenon in cattle to explore

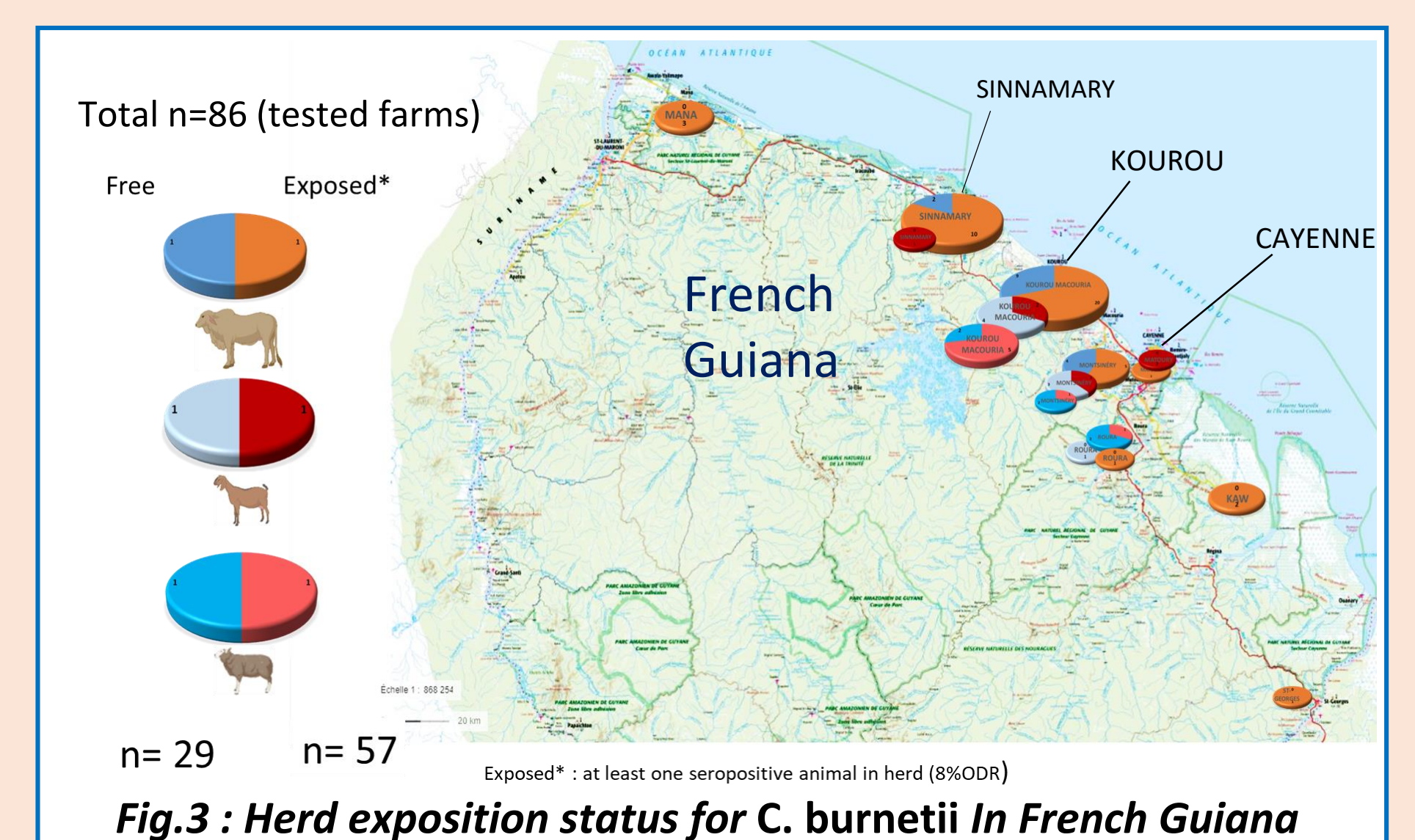


Fig.3 : Herd exposition status for *C. burnetii* In French Guiana

PERSPECTIVES

- Consolidate the evaluation of Q fever serological tests (on Guianese sera).
- Deepen studies on the epidemiological situation in ruminants: serology and PCR detection, diagnosis of abortion, spatio-temporal studies, search for risk factors.
- Improve and/or develop diagnostic tools suitable for epidemiological investigations in various animal reservoirs and environmental sources in French Guiana.
- Study the diversity of strains circulating in Guiana, harbouring probably antigens different to the antigen used in the Applied Biosystem Priocheck commercial kit.