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Epidemiological surveillance of schistosomiasis outbreak in Corsica (France): are animal reservoir hosts implicated in local transmission?

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INTRODUCTION: Environmental and anthropogenic changes are expected to promote emergence and spreading of pathogens worldwide. Since 2013, human urogenital schistosomiasis is established in Corsica island (France). Schistosomiasis is a parasitic disease affecting both humans and animals. The parasite involved in the Corsican outbreak is a hybrid form between *Schistosoma haematobium* and *Schistosoma bovis*, human and livestock parasites, respectively. *S. bovis* has been detected in Corsican livestock few decades ago raising the questions whether hybridization occurred in Corsica and if animals could behave as a reservoir for the recently established parasite lineage. If proven the latter hypothesis, it would have huge epidemiological impact since the emergence of a zoonotic lineage of schistosomes would greatly difficult the local control and eradication of the disease. Thus, this hypothesis definitely needs to be verified.

OBJETIVE

Identifying whether animals (livestock and/or wild rodents) can be reservoir hosts of zoonotic schistosomes in Corsica



METHODOLOGY:

- Sero-epidemiological survey of 3,519 ruminants:** serum from 1,147 cattle; 671 goats and 1,701 sheep from 160 farms established in 14 municipalities were collected in 2014 and 2015. Anti-schistosome antibodies were detected in the serum samples by ELISA using a tegument extract (TG) of *S. bovis* adult worms as coating antigen. ROC analysis was performed using 50 well-defined sera from sheep infected experimentally with *S. bovis* and 164 sera from naive sheep to select the cut-off value and establish the positive/negative state of all the animals sampled. ELISA INDEX (EI) = OD of each serum / mean OD of the negative control sera included in each plate.
- Rodent trapping campaign in the vicinity of Cavu river, where the schistosomiasis transmission is still persisting.** A total of 1,949 traps were placed during 10 trapping sessions. Schistosome infection in captures was analysed after necropsy by diagnostic PCR using Sh73/Dral assay, and on detected worms additional amplifications of ITS and Cox1 gene were carried out.

RESULTS:

Serology: among 3,519 screened animals, 17 were found seropositive, but after additional analyses were considered as false positive (Fig. 2, Table 1).

Rodent trapping: the 1,949 traps placed resulted in the capture of a total of 45 animals including 34 rats (*Rattus rattus*) and 4 mice (*Mus musculus*) (Table 2). Molecular diagnostic tests showed that only two rats were infected by schistosomes.

Figure 1. Mapping of the sampling area in south Corsica (a) and distribution of the sampled cows (b), sheep (c) and goats (d).

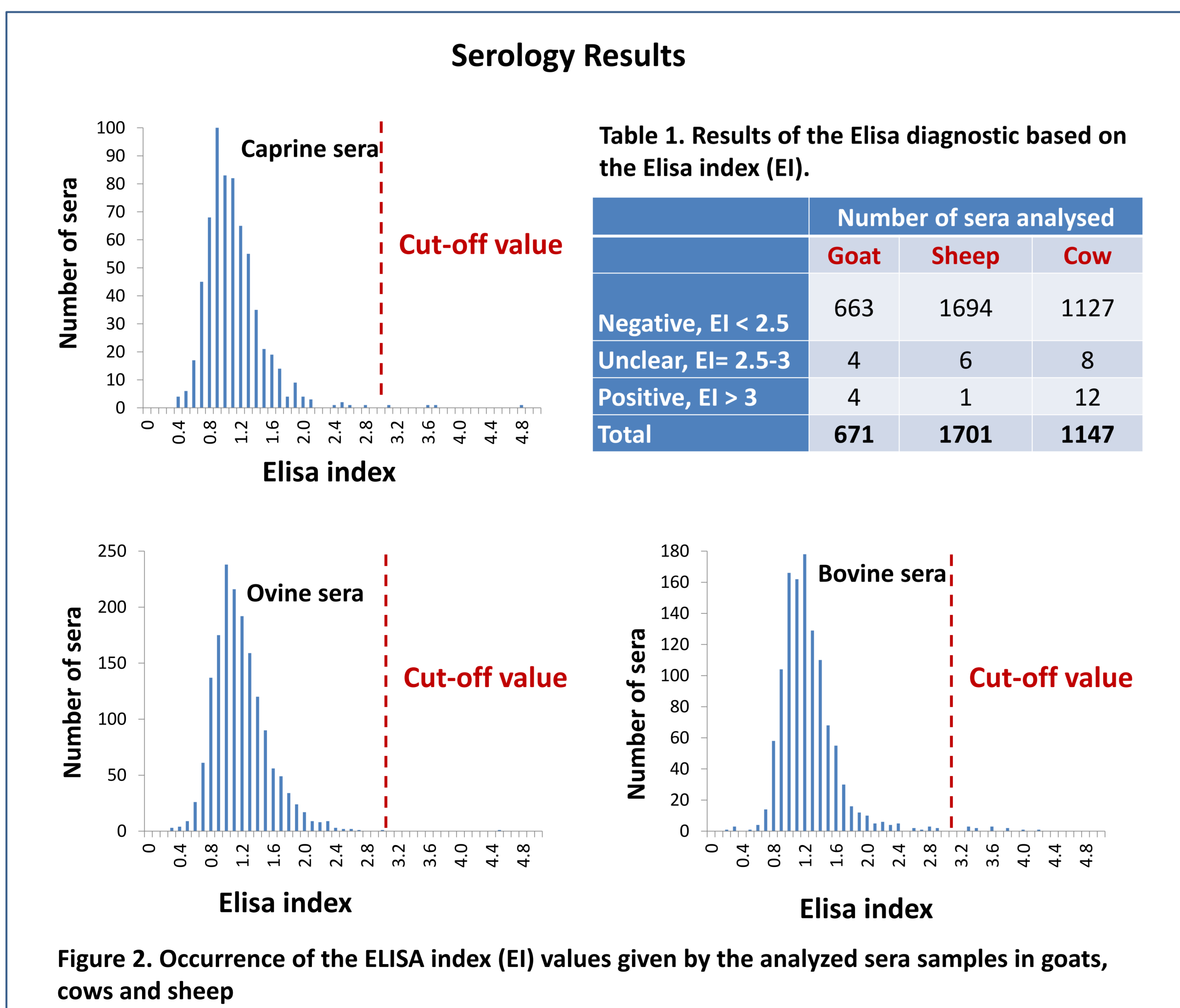
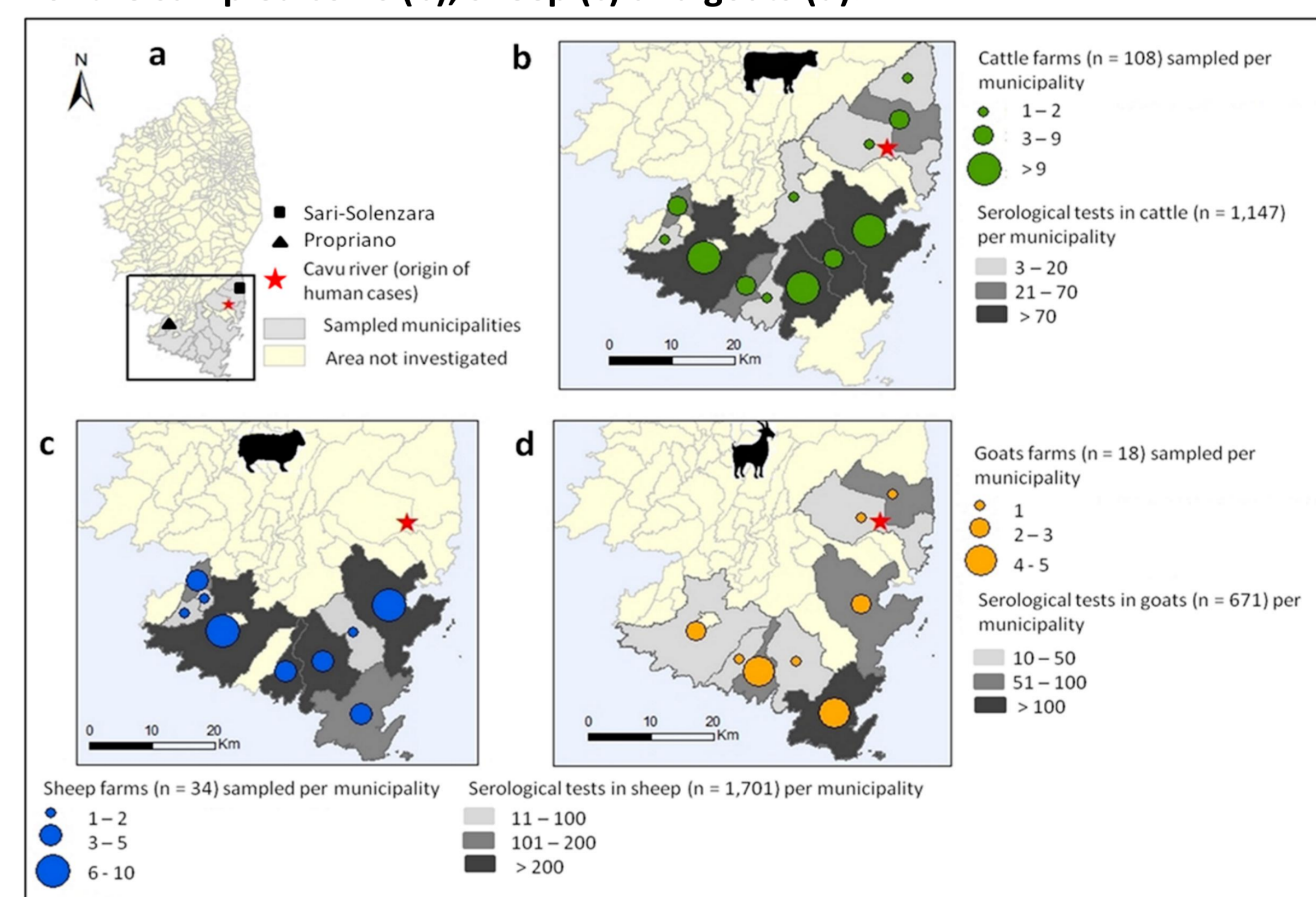


Table 2. Name, GPS coordinates and number of traps for each site. *, evidence of local human contamination during summer 2013 and 2015. Animals trapped: 34 rats, 4 mice, 2 shrews, 3 hedgehogs and 2 weasels.

Site name	Coordinates	Number of traps	Number of trapped animals (<i>Rattus rattus</i>)
Les trois piscines*	41°43'56.66"N 9°17'38.11"E	786	6 (5)
Le parc accrobranche*	41°43'26.86"N 9°17'55.09"E	731	24 (15)
Le pont de Conca*	41°42'23.15"N 9°20'0.65"E	298	8 (7)
L'école de Tagliu Rossu	41°42'28.81"N 9°19'3.78"E	80	5 (5)
La prise d'eau	41°42'52.99"N 9°18'14.68"E	54	2 (2)
TOTAL		1979	45 (34)

Two rats were infected by schistosome

CONCLUSIONS

This study shows that ruminants (cow, sheep and goats) should not play any role as reservoir host of zoonotic schistosomes in Corsica. Further, considering the low abundance of rodents and the low parasitic prevalence/intensity among rodents, it is unlikely that rats play a significant role in the maintenance of schistosomiasis outbreak in Corsica. However we can not definitively rule out the possibility of an animal species acting as reservoir host.

The most likely hypothesis is that local people initially infected in 2013 re-contaminate the river during subsequent summers and maintain the parasite locally.