

What drives the variation in abundance of one of the principle flea vectors of Plague in Madagascar?

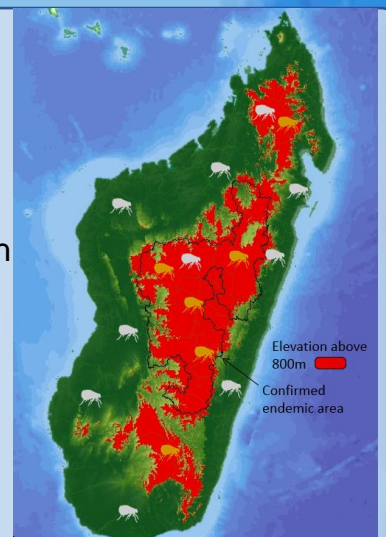
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Introduction & Background

Plague is endemic in Madagascar above 800m elevation. Human cases mainly occur between October and March. The main reservoir host is the black rat (*Rattus rattus*) and the two principle vectors are an endemic flea, *Synopsyllus fonquerniei*, which only occurs above 800m and an invasive flea, *Xenopsylla cheopis*, which occurs at all altitudes.

To inform epidemiological understanding and plague control measures we need improved knowledge of how the abundance of *S. fonquerniei* and *X. cheopis* varies spatially and temporally, and what factors drive this variation. Here we focus on the spatial and temporal patterns.

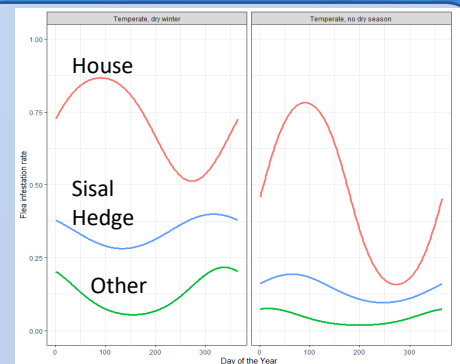
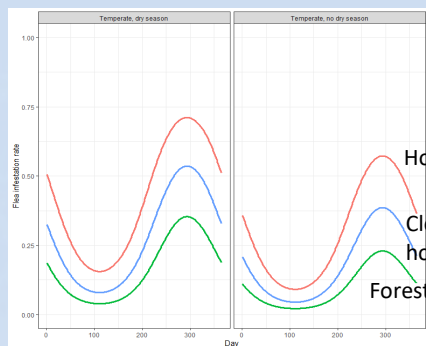


Methods

Fleas collected from rats (n= X) trapped in 100 sites covering different bioclimatic zones and landscapes (urban, rural agricultural, natural forest). Within sites, sampling covered different local habitats (e.g. houses, rice-fields, forest). Generalised Linear Mixed-Effect Models were used to explore how the risk of infestation for each of the flea species varied with season, bioclimate zone, landscape and local habitat.

Results *X. cheopis* – Figure = Prediction plot based on best model

- Infestation highest inside and close to houses and declines as distance from house increases.
- The seasonal cycle of infestation varies between inside houses and outdoor sites, but is strongest inside houses.
- Infestation rate higher in areas with a dry season.
- Urban environments have the highest infestation rates, with lowest infestation seen in areas near forests.



Results *S. fonquerniei* – Figure = Prediction plot based on best model

- Infestation is lowest inside houses and increases with distance from houses and towards forests.
- Sites closer to forests have higher flea infestation rates than sites further away.
- Strong seasonal variation is seen across all sites, peaking in Sep - Nov and lowest during the wet season (Jan - Mar).
- Infestation rate is higher in areas with a dry season.

Conclusions

S. fonquerniei's seasonal cycle suggests a strong link between infestation rate and human plague transmission. Both species have higher infestation in bioclimates with a dry season, indicating that humidity may affect flea abundance. *X. cheopis*'s indoor seasonal cycle is the inverse of *S. fonquerniei*'s cycle, which may point to a plague maintenance mechanism.

Thanks for reading!!
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