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Reconstructing rodent contact networks from trapping data to understand Lassa fever transmission networks

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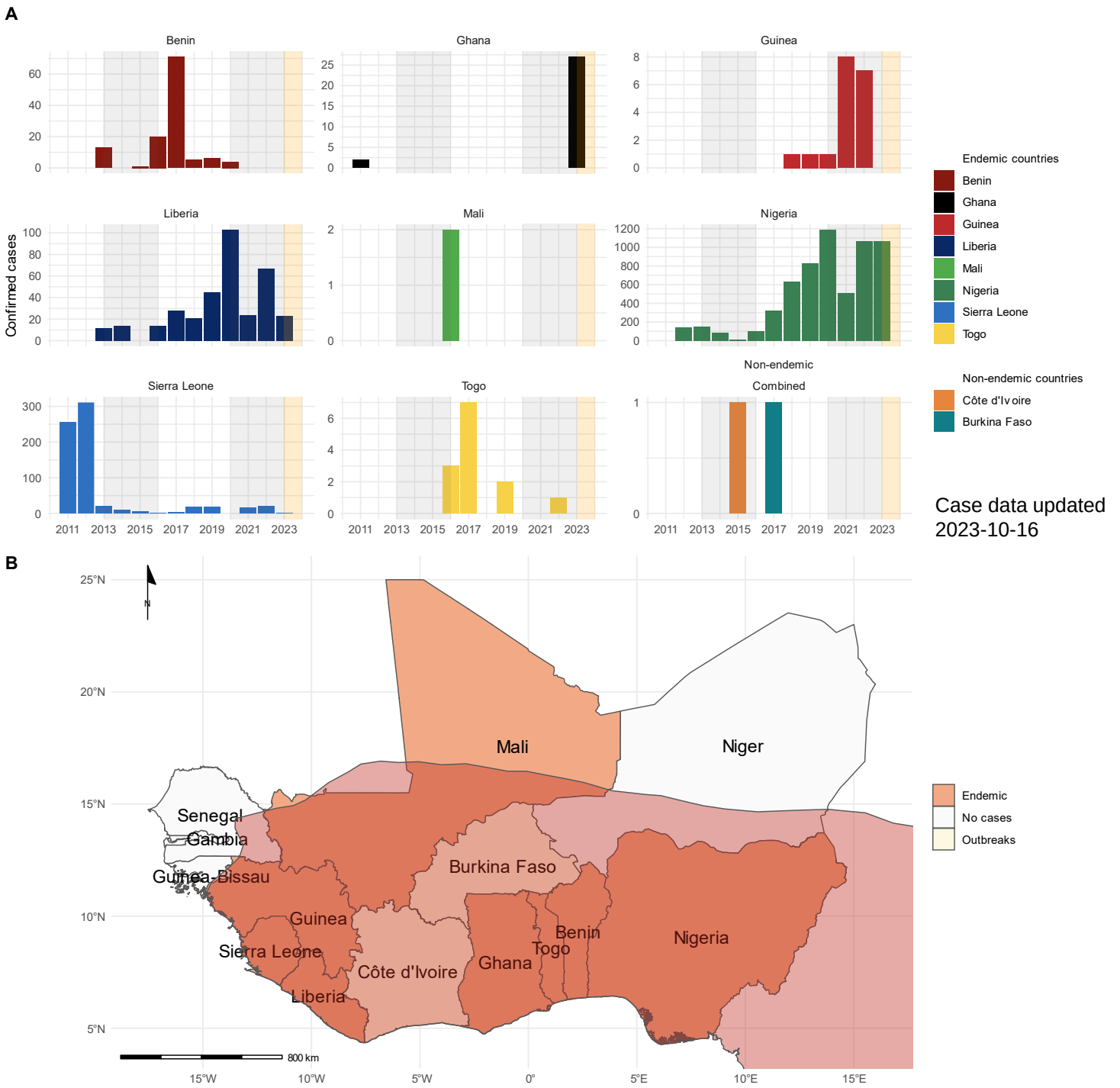
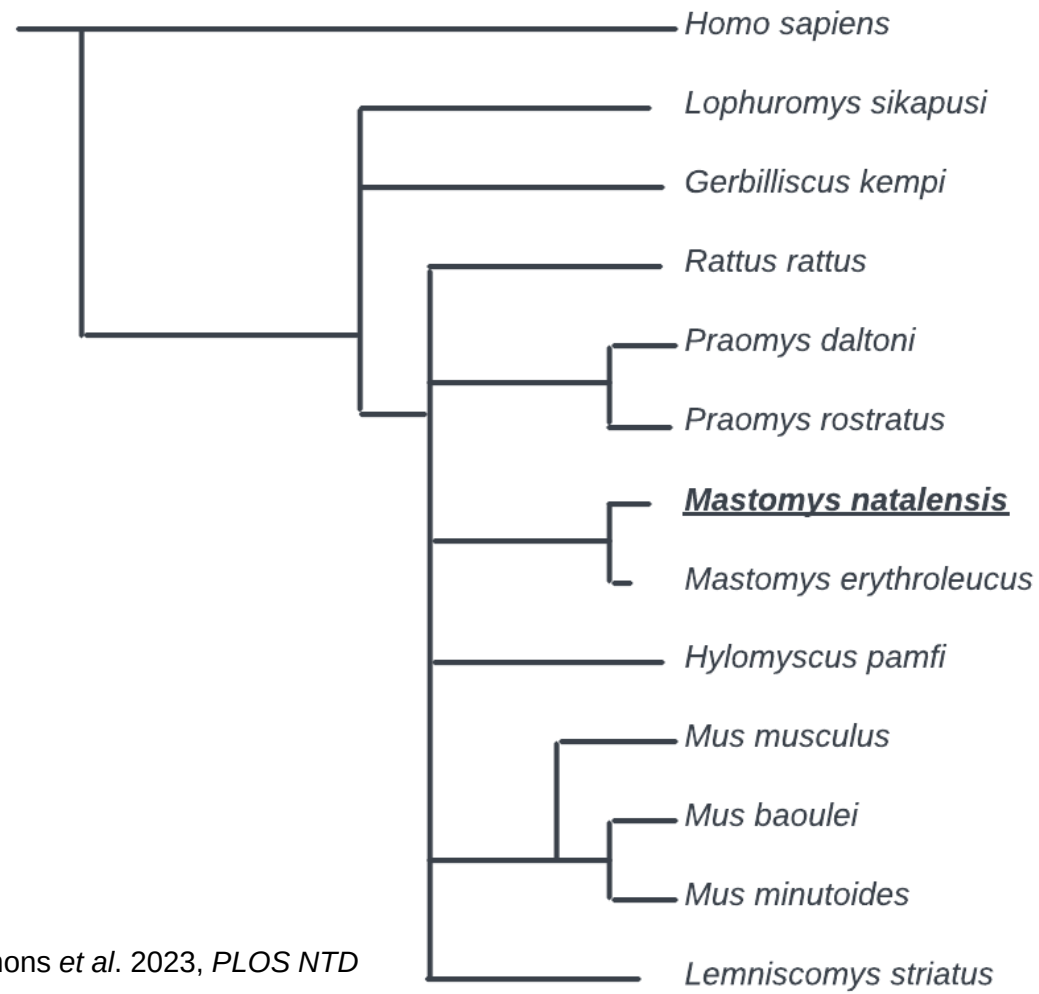
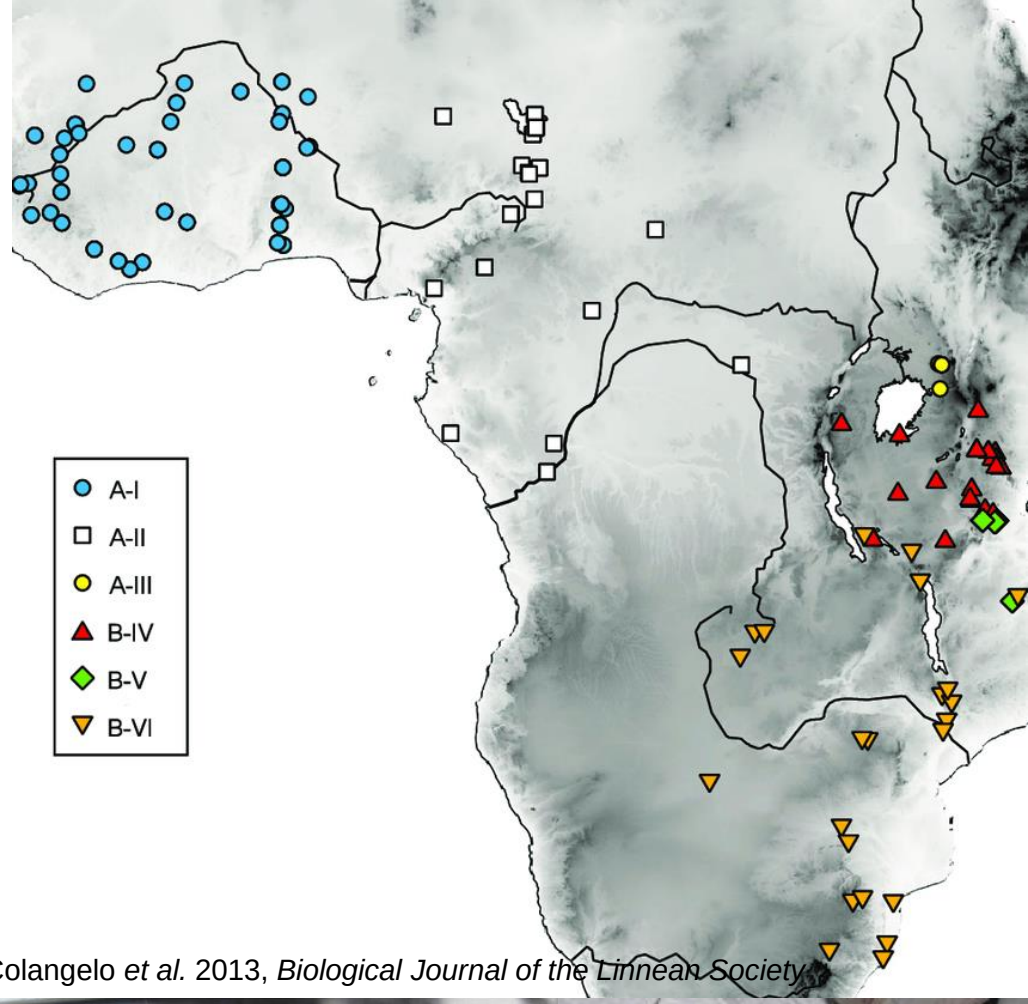
Lassa fever in West Africa



Lassa mammarenavirus and rodent ecology



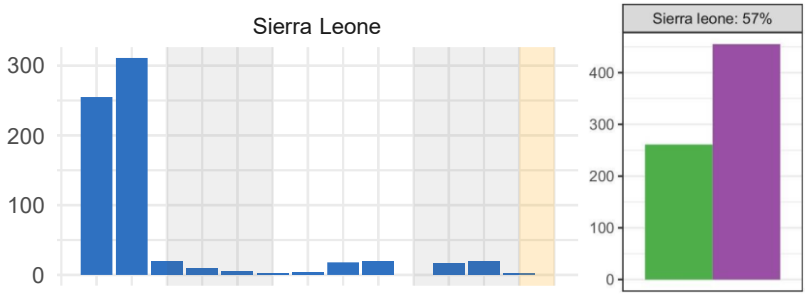
Simons *et al*. 2023, *PLOS NTD*



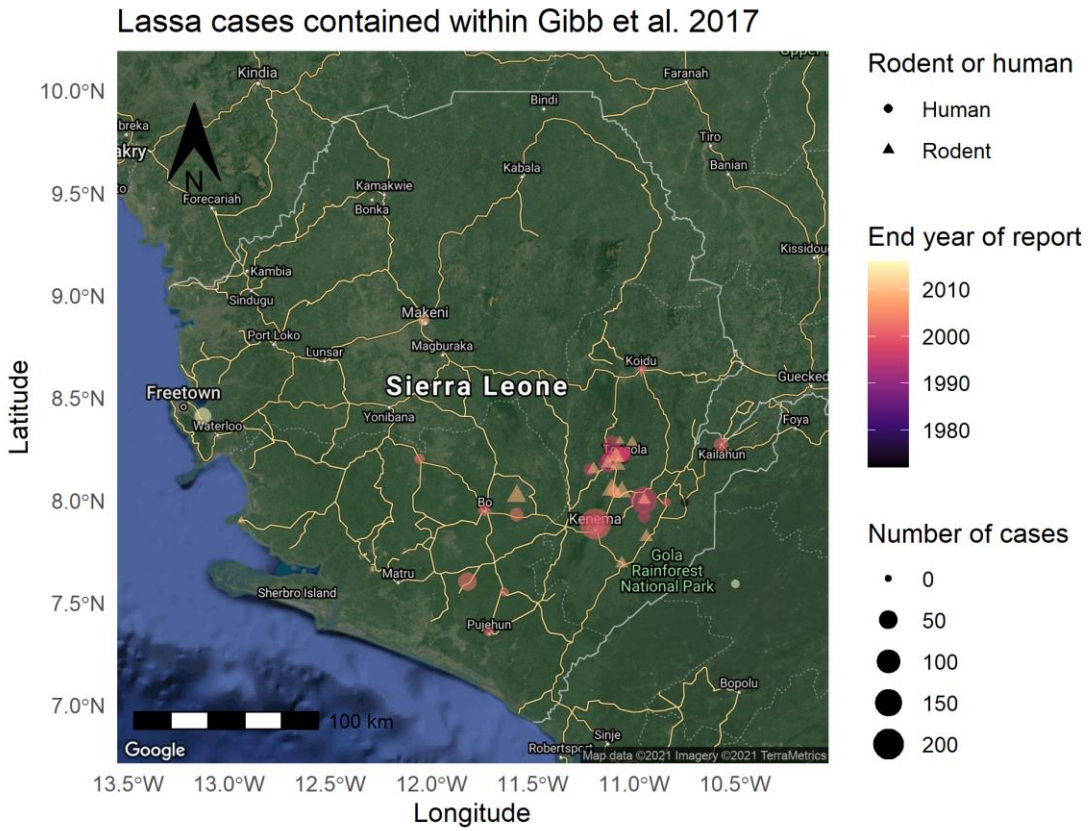
Colangelo *et al.* 2013, *Biological Journal of the Linnean Society*

Kelly *et al.* 2013, *BMC Int Health Hum Rights*

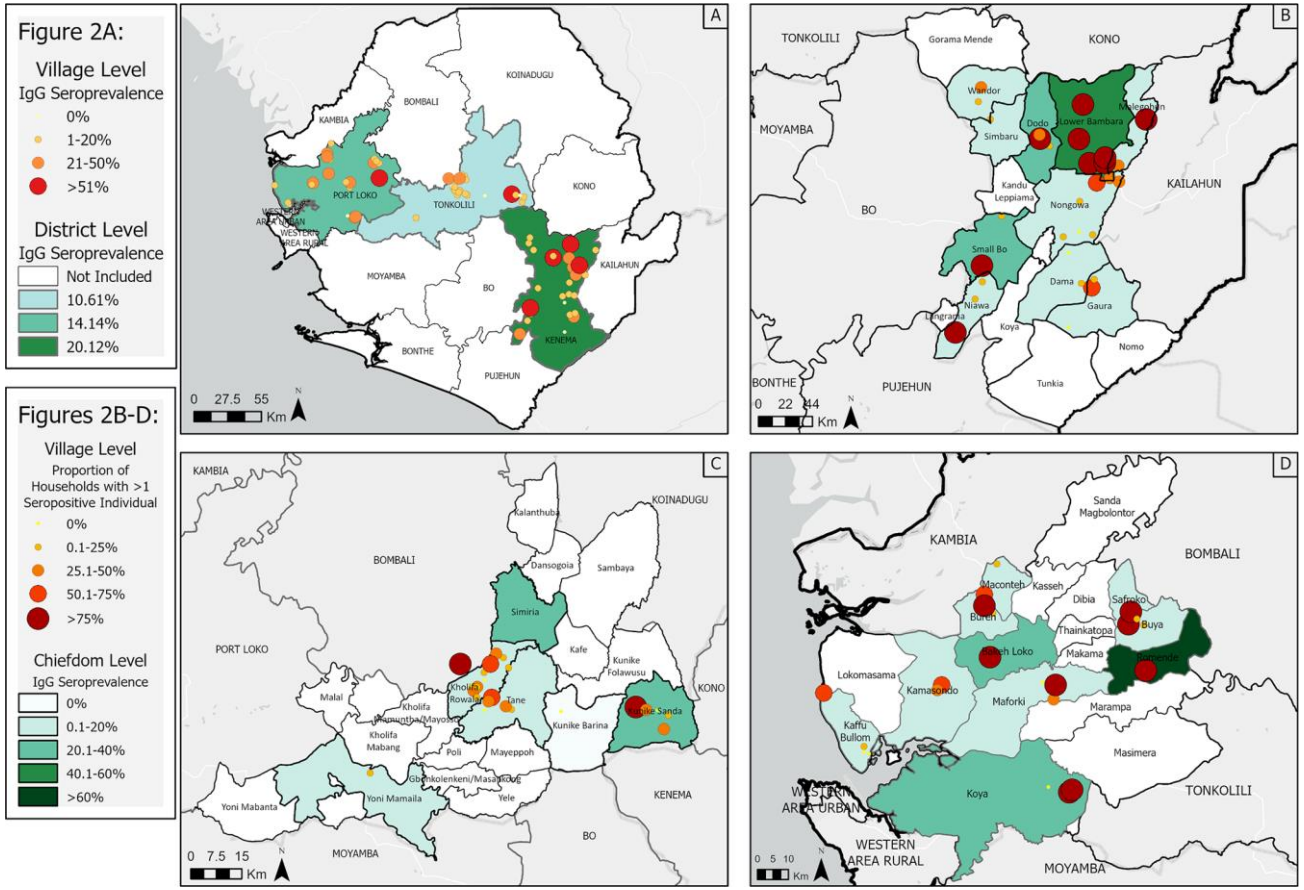
The burden of Lassa fever in Sierra Leone is not well understood



Simons, D. 2023, *Int Health*

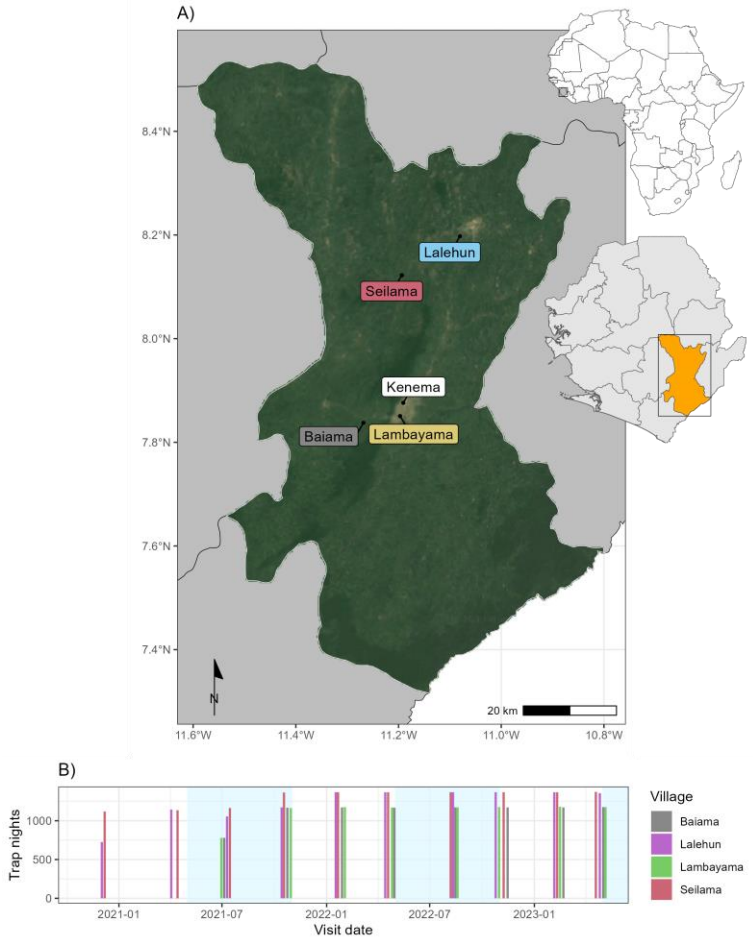


Gibb *et al.* 2017, *Pathog Glob Health*



Grant *et al.* 2023, *PLOS NTD*

Hosts of Lassa mammarenavirus occur in species rich small-mammal communities



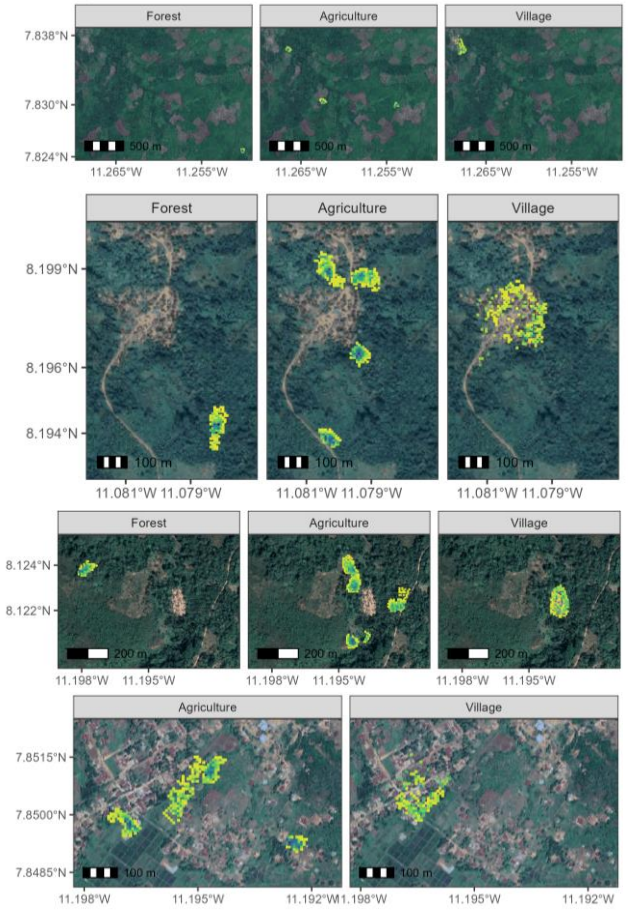
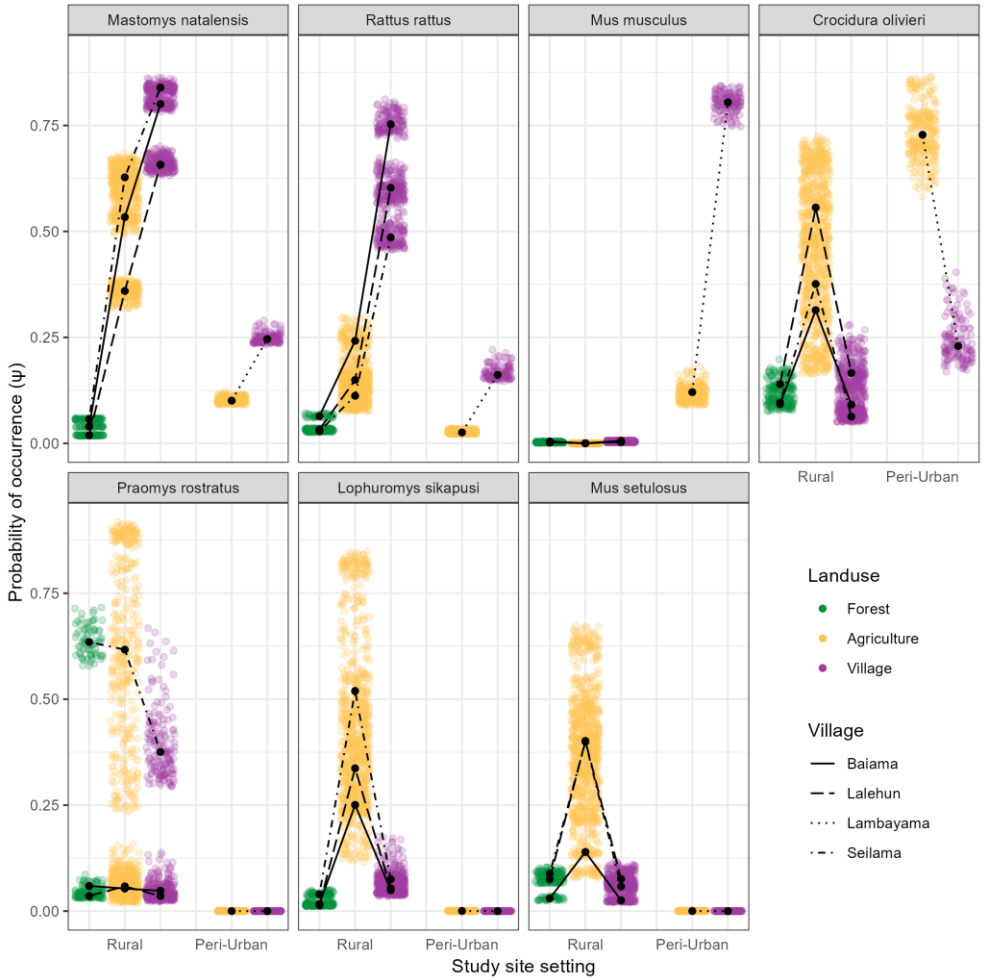


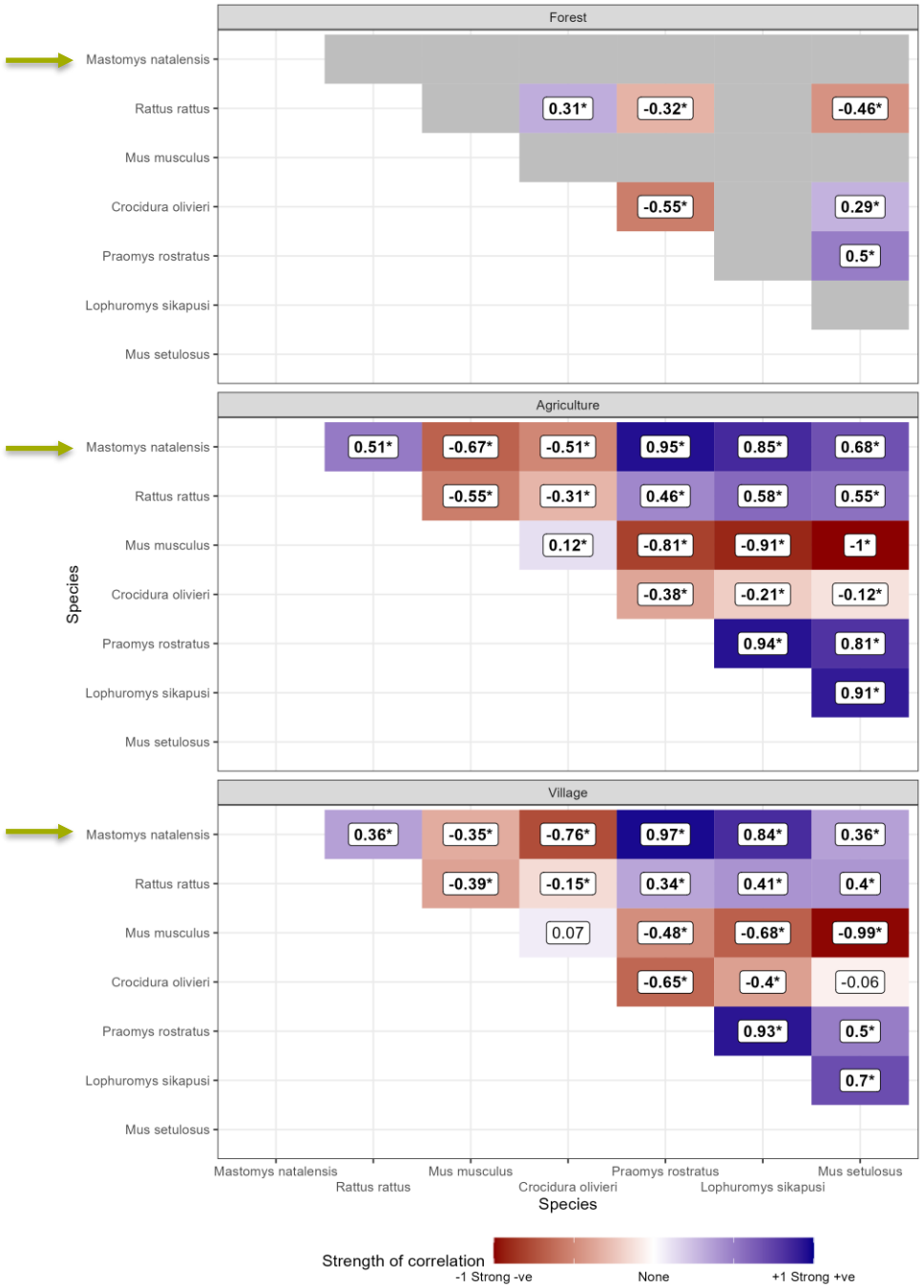
Table 5.1: The number of individuals detected and antibodies to Lassa mammarenavirus among those individuals by species.

Species	N[1]	LASV Antibody detected (%)	Percentage of all positive individuals
Mastomys natalensis	113	11 (9.7%)	28.2%
Crocidura olivieri	105	8 (7.6%)	20.5%
Lophuromys sikapusi	57	8 (14%)	20.5%
Rattus rattus	88	4 (4.5%)	10.3%
Mus setulosus	43	3 (7%)	7.7%
Praomys rostratus	102	2 (2%)	5.1%
Malacomys edwardsi	11	1 (9.1%)	2.6%
Hybomys planifrons	7	1 (14.3%)	2.6%
Mastomys erythroleucus	4	1 (25%)	2.6%
Mus musculus	90	0 (0%)	0%
Crocidura buettikoferi	23	0 (0%)	0%
Crocidura grandiceps	15	0 (0%)	0%
Lemniscomys striatus	11	0 (0%)	0%
Hylomyscus simus	9	0 (0%)	0%
Crocidura theresae	3	0 (0%)	0%
Gerbilliscus guineae	2	0 (0%)	0%
Dasymys rufulus	1	0 (0%)	0%

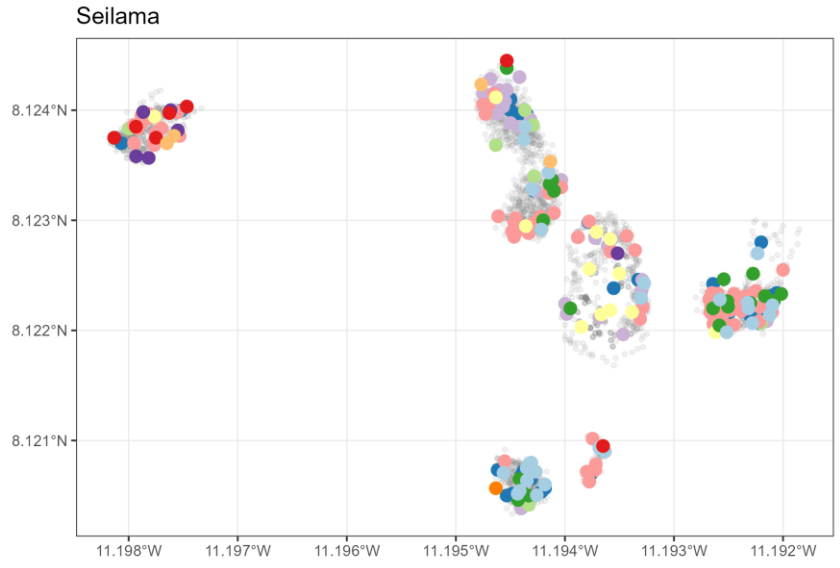
Note:
The consensus result of antibody testing is reported for samples producing equivocal results.
[1] Number of rodents tested (N)

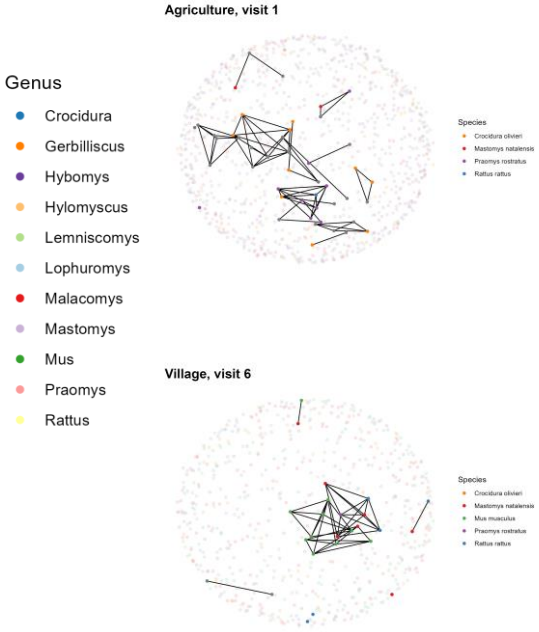
Mastomys natalensis primarily occurs in anthropogenically dominated habitats but is less likely to occur in urbanised settings.

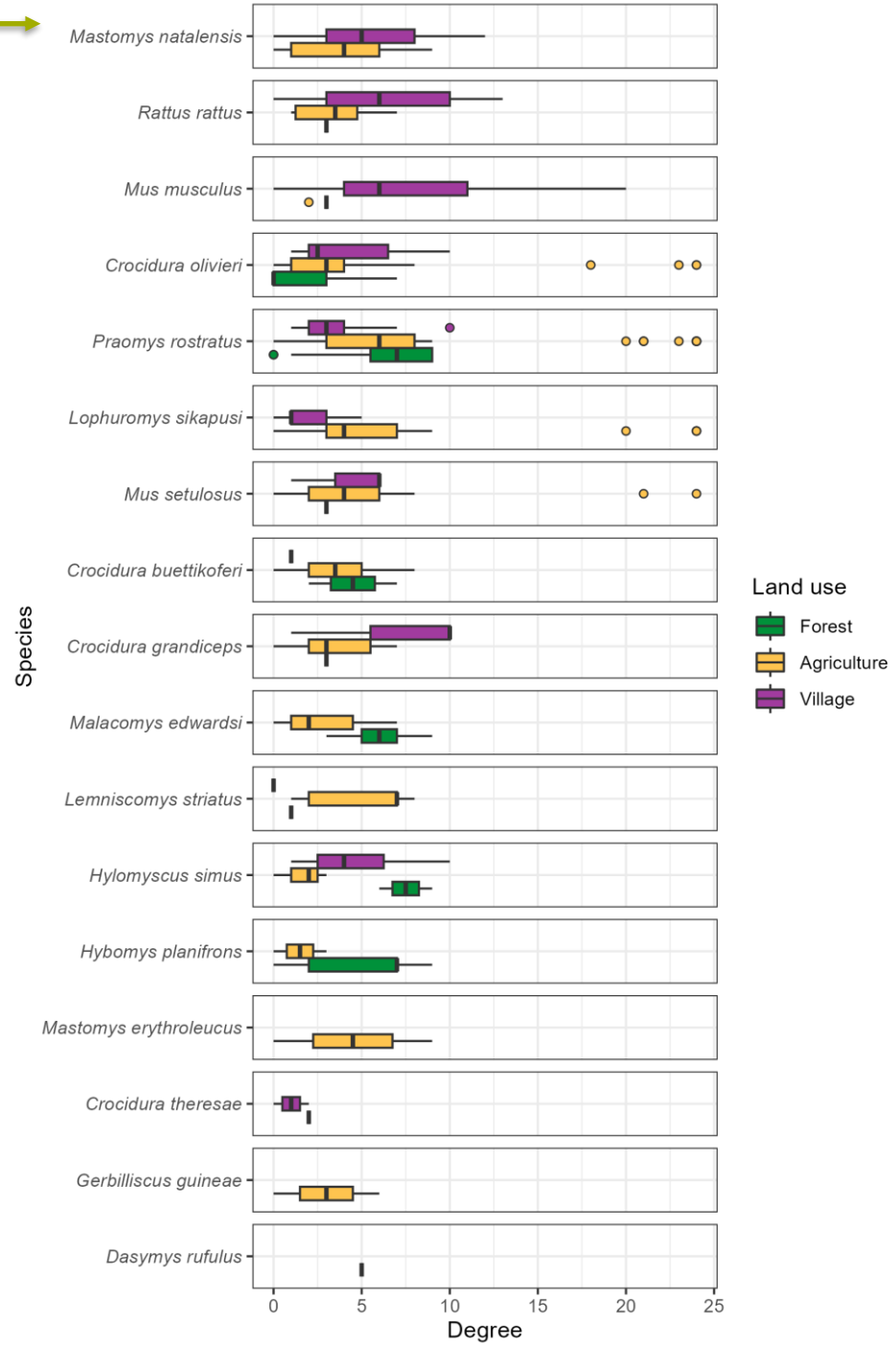




Constructing inferred contact networks with detected small mammals

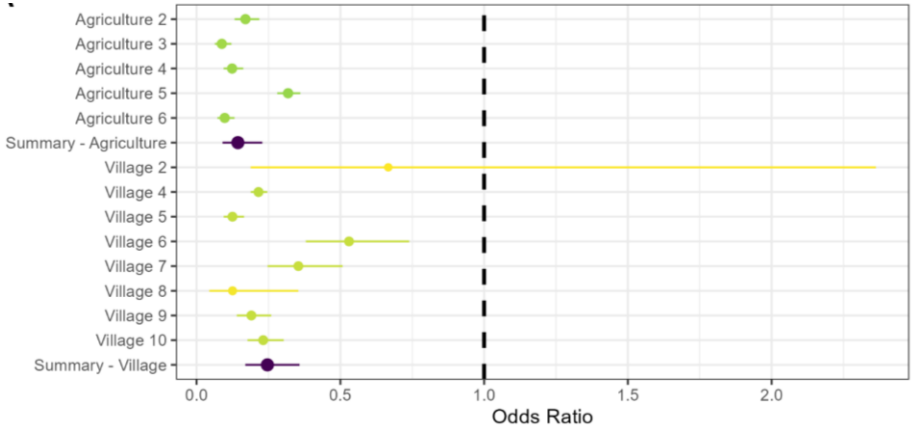




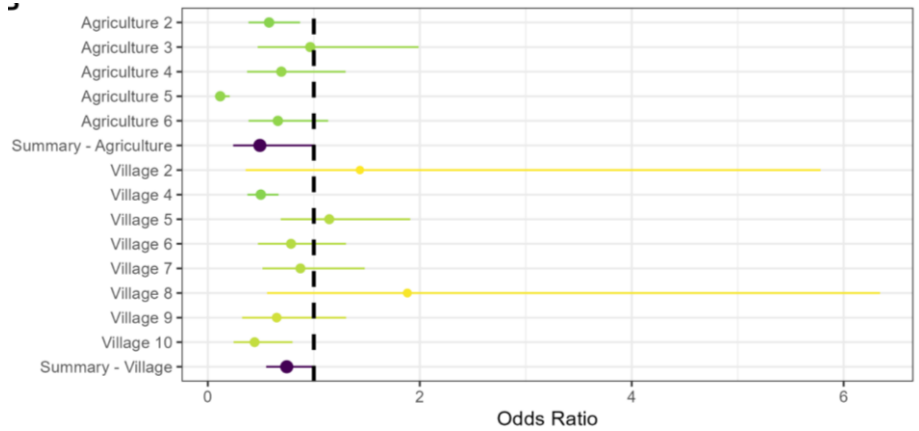


Mastomys natalensis is more likely to form intra-specific contacts and these are more likely to occur in agricultural settings compared to other small-mammal species

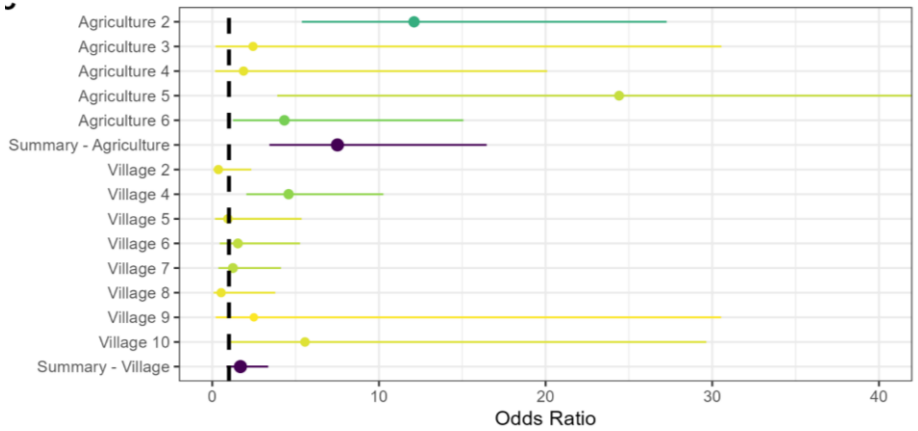
a) Odds of a contact being detected



b) Odds of an interspecific contact



c) Odds of an intraspecific contact



Potential implications for LASV transmission, Lassa fever epidemiology and public health interventions

1. Sustained chains of LASV transmission among rodent hosts may preferentially occur in agricultural land use.
   a) These species rich settings may increase the rate of spillover to other small-mammal species.
2. Migration of *Mastomys natalensis* from fields to villages may translocate infected hosts.
   a) Rodent removal in villages may have paradoxical effects on LASV prevalence in rodents due to changes in contact networks.
   b) Epidemiological studies solely limited to village settings may not reflect the heterogeneous spillover risk profile.
3. Longer term studies are required to better understand pathogen- and host-dynamics and transmission networks that are required to better design and evaluate public health interventions.

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Acknowledgments

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- Rashid Ansumana, Dianah Sondufu, Joyce Lamin, Mike Dawson, Joseph Lahai (Njala), James Koninga, Momoh Jimmy (Kenema)
- The communities of Baiama, Lalehun, Lambayama and Seilama, Sierra Leone
- LIDo (BBSRC) and PANDORA-ID-NET (EDCTP)