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Small hive beetle, *Aethina tumida* (SHB), can cause more damage to honeybee, *Apis mellifera*, host colonies in areas with higher infestations. These higher infestation levels tend to occur in the invasive populations of SHB, but data comparing spatiotemporal variation of SHB infestations across multiple native and invasive SHB populations are scarce. Here, we measured SHB infestation levels by visually screening honeybee colonies across three native populations in South Africa, Nigeria and Kenya, and five invasive populations in Brazil, Italy, Australia and the states of Maryland and Alabama in the United States. We tested the effects of movement of new colonies to an apiary, previous use of SHB traps or other management methods and the number of colonies at an apiary on SHB infestation levels. Our data show that SHB infestation levels can be equally high in native and invasive populations, suggesting that differences between host honeybee populations, rather than the sheer number of SHBs, is the key criterion for damage caused by SHB. Our data also show spatial variation in SHB infestations within populations, but this was not explained by movement of colonies, the number of colonies at an apiary, or previous use of SHB management methods. The lowest SHB infestations were observed in Italy, possibly due to strict control management, e.g. protective zones and restricted movement of beekeeping material. It is apparent that our understanding of the drivers of variation in SHB infestations is still limited, calling for more efforts to elucidate our knowledge of this host-parasite system. Considering our results, future studies should especially address the role of quantitative behavioural differences between honeybee hosts following SHB incursion into colonies. While none of the variables we studied explained the spatial variation in SHB infestation levels, we want to highlight the importance of limiting SHB reproduction in its invasive range by maintaining strong colonies and clean facilities. Furthermore, our results indicate that new SHB introductions may be better contained by rapid implementation of strong management practices.

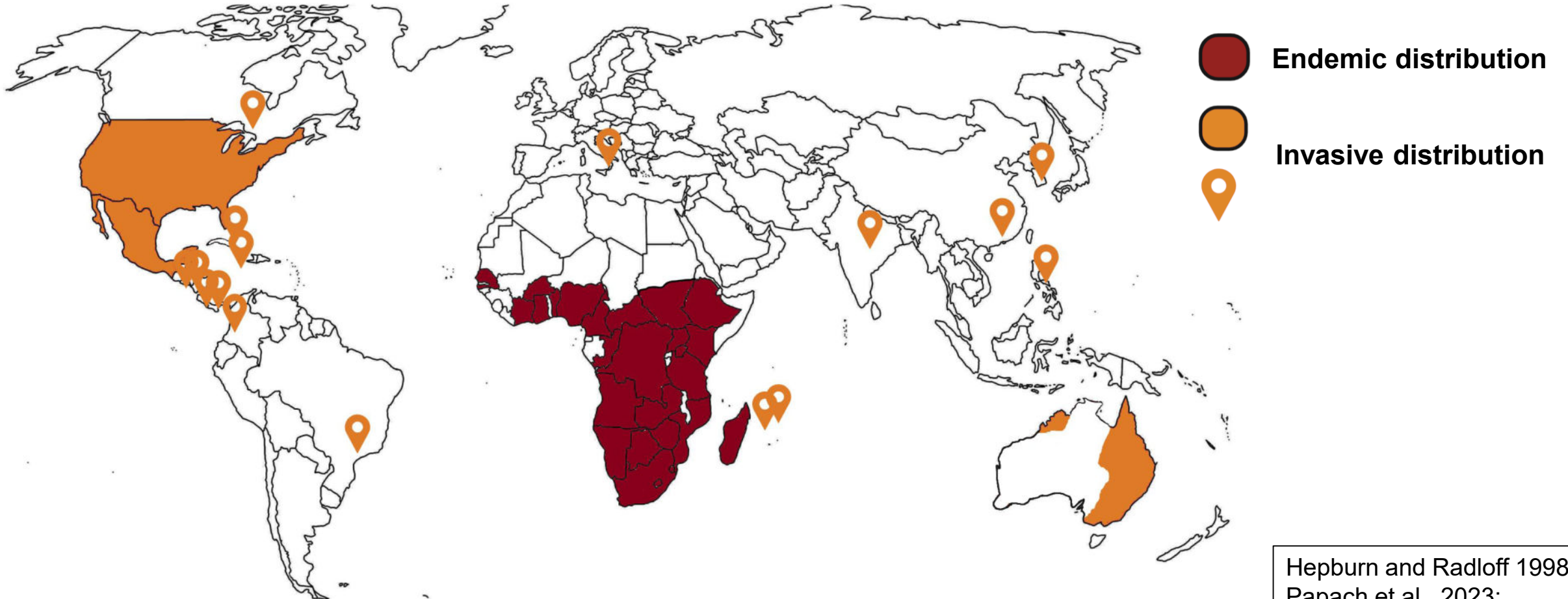


Not a numbers game – small hive beetle (*Aethina tumida*) infestations of honey bee host colonies

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Geoffrey R. Williams, Rachel Jacobsen, Jay D. Evans, Francisco J. Posada-Florez, Christian
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Hart, Clarissa M. House, Giovanni Federico, Giovanni Formato and Peter Neumann**

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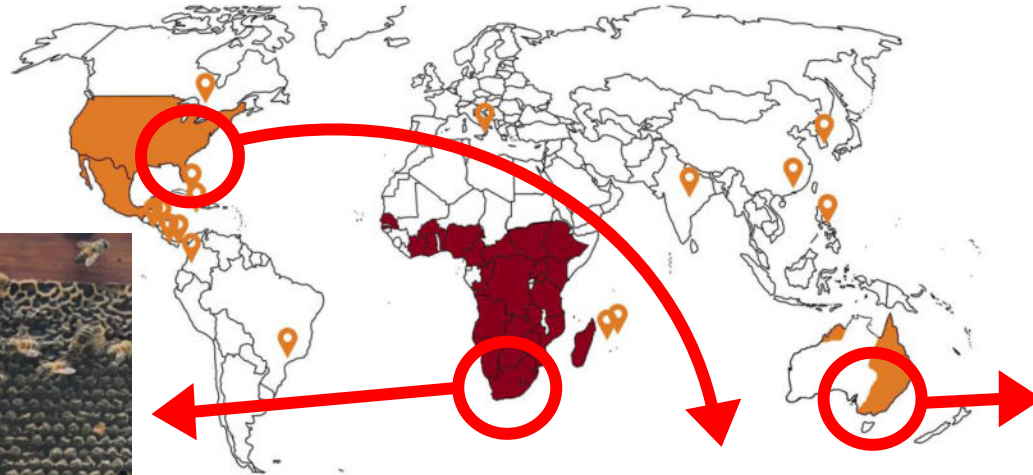
Small hive beetle distribution



Hepburn and Radloff 1998;
Papach et al., 2023;
Kumaranag et al., 2025

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SHB in endemic vs. invasive ranges



Lundie 1940;
Neumann and Elzen, 2004;
Neumann et al; 2016

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Research question and hypotheses

Do SHB infestations vary across endemic and invasive regions?



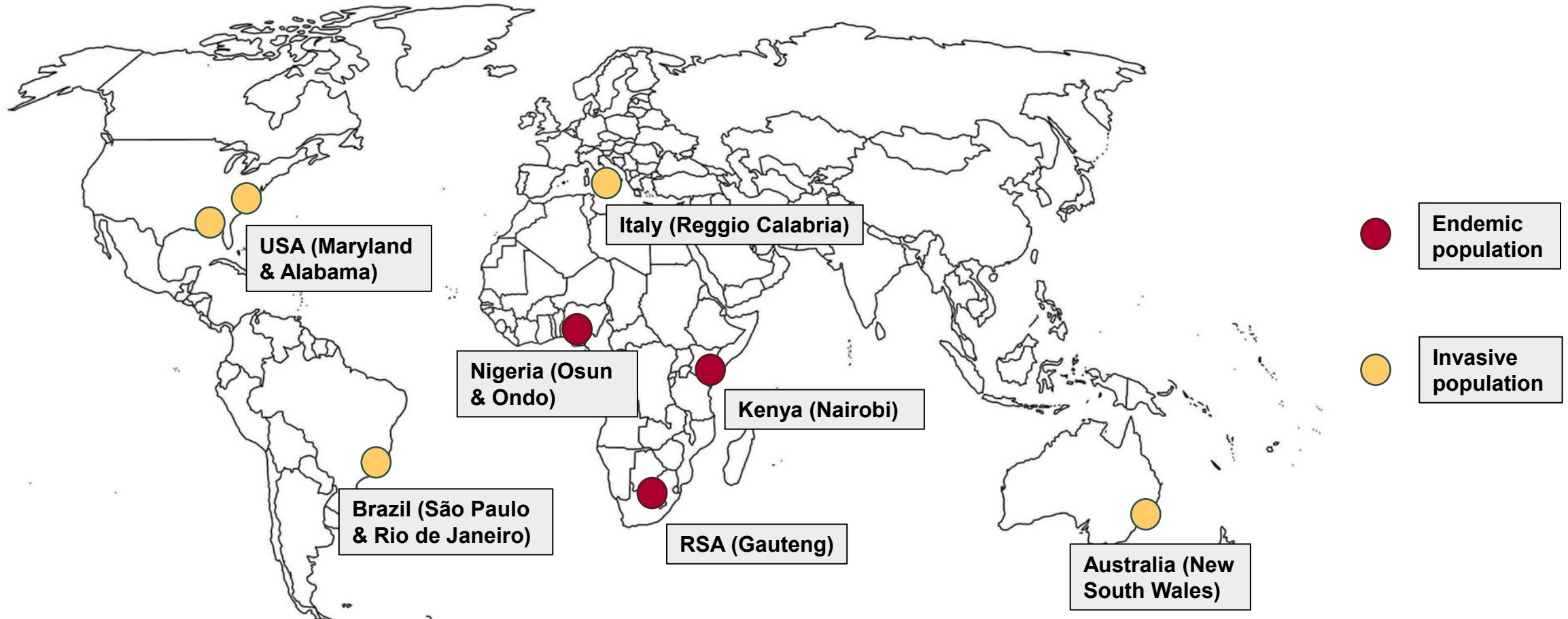
Lower infestation levels in the **endemic** regions



Higher infestation levels in **invasive** regions

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Sampling locations



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Estimating SHB infestation levels

- **Visual screening** of honey bee colonies
- Counting number of SHB found
- Repeated in 3-4 apiaries/ location
- 4-10 colonies/ apiary
- **Total N colonies = 301**



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Sampling of adult SHB



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Adult SHB in a honey bee colony

Spiewok et al., 2007;
Neumann et al., 2013;
Cornelissen & Neumann 2018

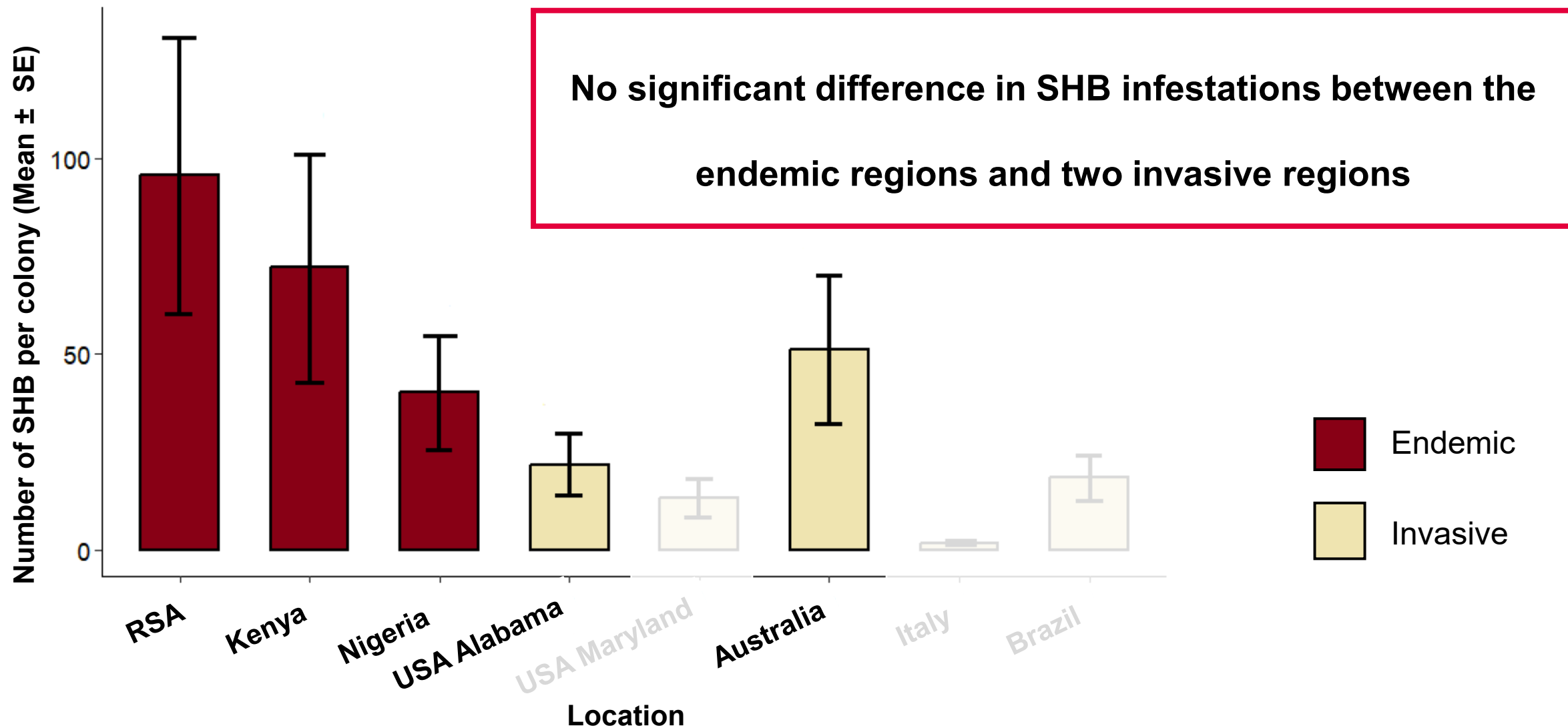
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Data analyses

- Statistical model of the effect of sampling location on infestation levels
- Model used to **predict average SHB numbers and compare them across locations**

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Key findings



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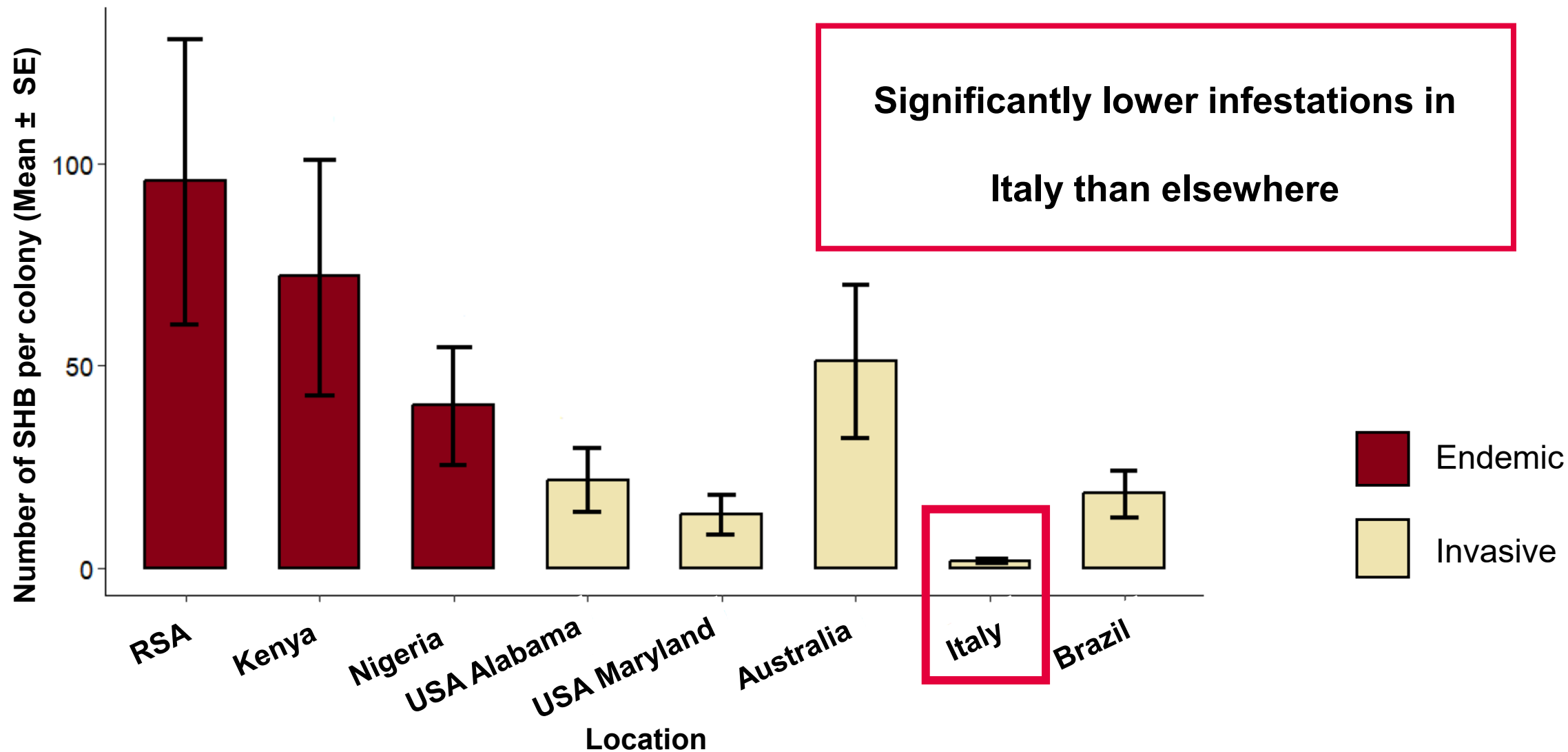
Key findings

- **More SHBs, more damage to honey bees? Not always!**
- **Host ability to cope with infestations** may be the key
- The behavioural differences between honey bees from different origins should be studied further
- Future research should also estimate the role of **SHB reproduction in hive debris**

Ellis et al., 2003;
Neumann & Ellis, 2004;
Neumann et al., 2016;
Neumann et al., 2018

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Additional insights



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Additional insights

- Long dry periods may affect SHB pupation success
- Various measures against SHB may have slowed down the spread of the invasive population



Federico et al., 2025

u^b Take-home message

- **High SHB infestation levels are not confined only to invasive regions**
- Understanding the link between SHB numbers and consequences on honey bee colonies is crucial

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Thank you for your attention!

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