

Spatial distribution of phlebotomine sand flies in Southwest Germany

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Introduction

Phlebotomine sand flies are vectors of several infectious pathogens and their distribution in Europe is changing due to globalization and climate change.³ The risk of potential future establishment² of sand flies in parts of Southwest Germany is increasing, as climate conditions indicate that suitable living conditions are given in Germany. Previous studies have proven the natural occurrence of sand flies in Germany.⁵

Two phlebotomine species were recorded: *Phlebotomus perniciosus* and *Phlebotomus mascittii*.^{4,6} Therefore a longitudinal study was initiated in 2015 with the aim to assess the abundance of sand flies and new sites in Southwest Germany. Data of their spatial distribution patterns were insufficient⁴ and as the Upper Rhine Valley is identified as a risk area it was taken into special consideration in our study.

Biotypes and Study Area



Fig. 1: Interior view of several positive sites in Germany

Methods

A longitudinal study along the Upper Rhine Valley was carried out in the federal states **Baden-Württemberg (BW)** and **Rhineland-Palatinate (RP)** from Aug 2015 to Sept 2017:

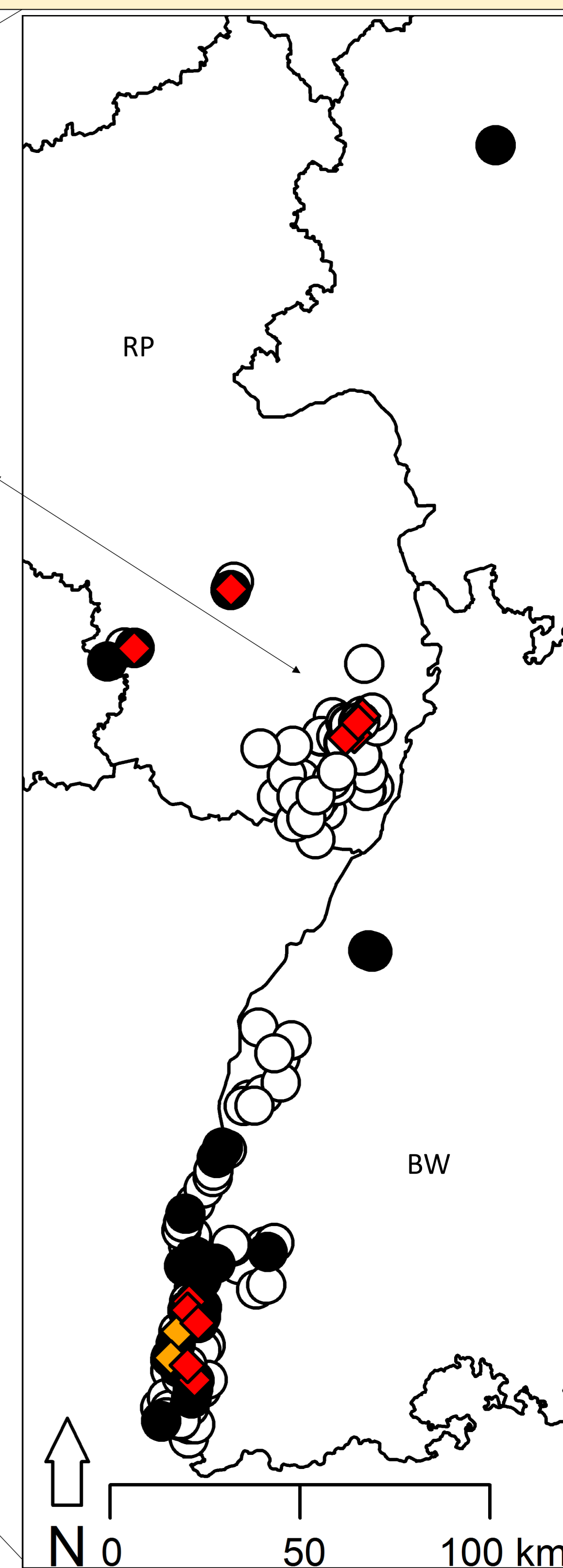
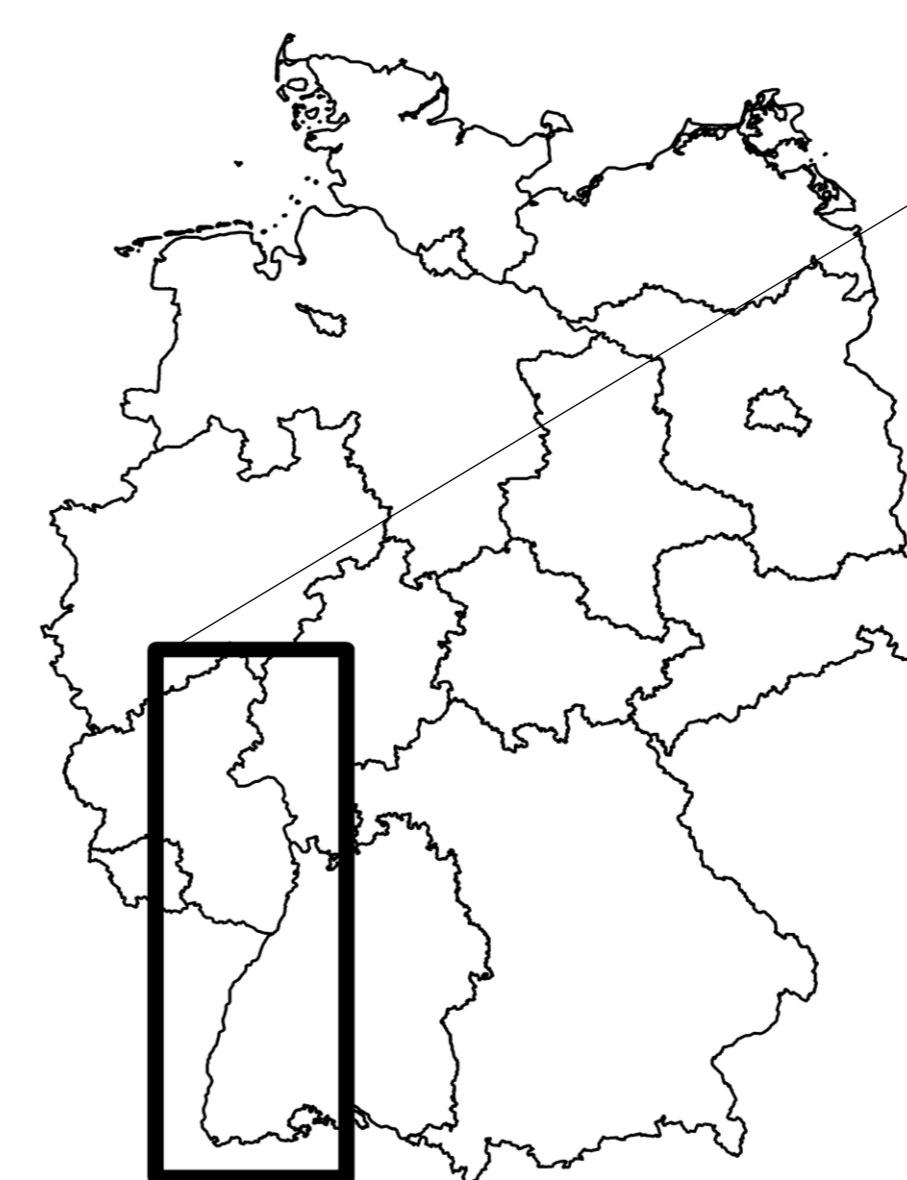
1. Creation and distribution of an information flyer to the communities, veterinarians, health authorities and municipalities as well as advertisement in local newspaper and official journals.
2. Identification of potential new sites and confirmation of previous positive sites on sand fly presence.
3. Sand fly sampling: Collection was done with CDC miniature light trap 512 (Bioquip, CA) and sticky traps. 1-5 CDC Traps were deployed per site overnight. For some sites attractants like Octenol, CO₂ and apricots were used.¹ Insects were immobilized and preserved in 100% ethanol.

Upcoming activities:

- Morphological identification of phlebotomine sand flies newly found in Rhineland-Palatinate for DNA-Extraction → DNA-Barcoding → Comparison of the sequences with known sequences.
- Individuals identifiable → Pathogen Screening - Individuals not identifiable → Morphological analysis → Pathogen Screening.
- Soil sampling: For several positive sites soil samples were taken to analyse on pH and organic materials.

Results

- **2015:** 5 out of 7 locations were positive for phlebotomine sand flies (Fig. 2, Fig. 3).
- **2016:** 36 sites were assessed and no sand flies could be recorded although the trapping locations had been extended. Reasons assumed: unfavourable weather conditions in June (rainy periods) and unexpected low temperatures in August (Fig. 2, Fig. 3).
- **2017:** 17 out of 99 locations were positive for phlebotomine sand flies: in the state BW, 2 new sites were identified and known positive sites could be confirmed; in the state RP, 10 new sites out of 65 locations were identified positive (Fig. 2, Fig. 3).
- The majority of productive sites were located in old obsolete barns with clay soil within the villages close to humans (Fig. 1).



- negative
- pos. before '15
- ◆ pos. '15
- ◆ pos. '17

Fig. 2: Spatial distribution of negative and positive sand fly habitats in Southwest Germany for 2015, 2016 and 2017

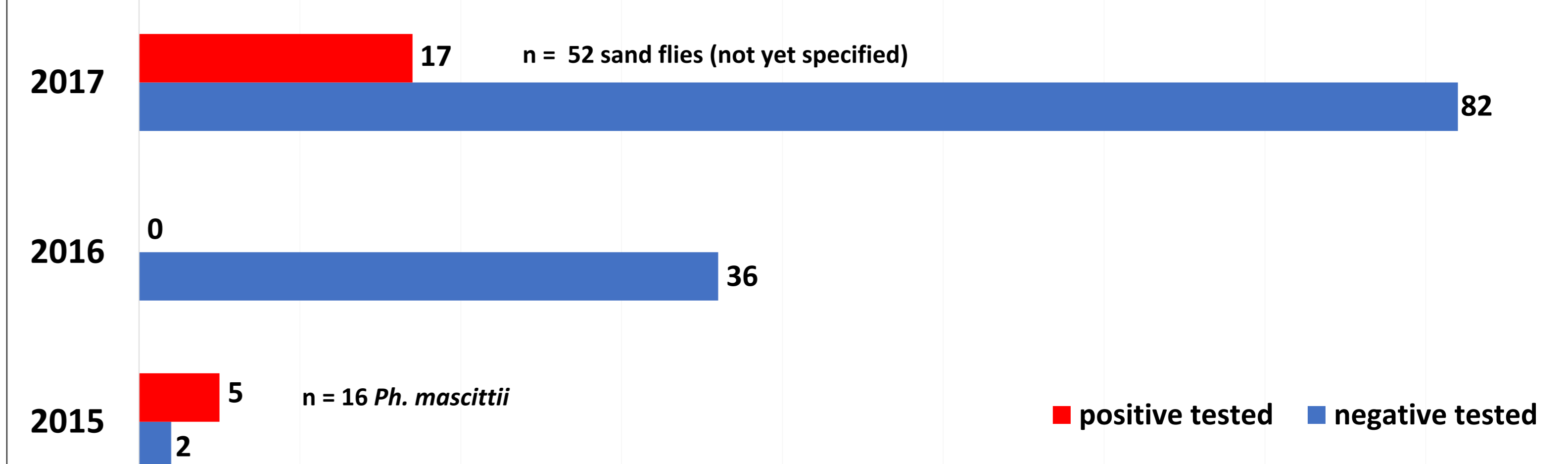


Fig. 3: No. of tested habitats positive (red) and negative (blue) in Germany in 2015 to 2017

Conclusions

- The occurrence of phlebotomine sand flies in Southwest Germany is estimated to be larger than the number of already caught specimens suggests. There is a risk factor for public health. More importance in future vector surveillance studies and cooperative field work would be a supposable asset to be undertaken in future research throughout the EU.
- The surveillance of sand flies should be continuously optimized as well as the attempt to expand to other regions not yet investigated.
- While it is essential to maintain vector control and prevention, information and practices at the household level should actively be targeted and embedded to improve future control.

References

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