

Using bumblebee chemical footprints to assess flower visitation in the field



Wiebke Kämper¹, Nico Blüthgen², Thomas Eltz¹

¹Department of Animal Ecology, Evolution and Biodiversity, Ruhr-University Bochum, Germany

²Ecological Networks, TU Darmstadt, Germany

Background information

Assessing flower visitation is problematic because

- Collecting census data is very time consuming
- Visitation patterns are highly sensitive to weather conditions and season

Demand for a reliable assessment method

- Bumblebees leave compared to other pollinators a large amount of long-lived hydrocarbon footprints on flowers
- Components improve tarsal adhesion and prevent water loss
- Relative amounts of components are species specific

Alkenes in footprints are a good indicator for bumblebee visits (Fig. 1) and have certain advantages...

- Alkenes accumulate over time and remain on a plant's corolla



- Less sensitive to weather than census data

- Footprint extracts can be taken in a very short time instead of spending hours on a plot

➔ many plots can be surveyed in one day

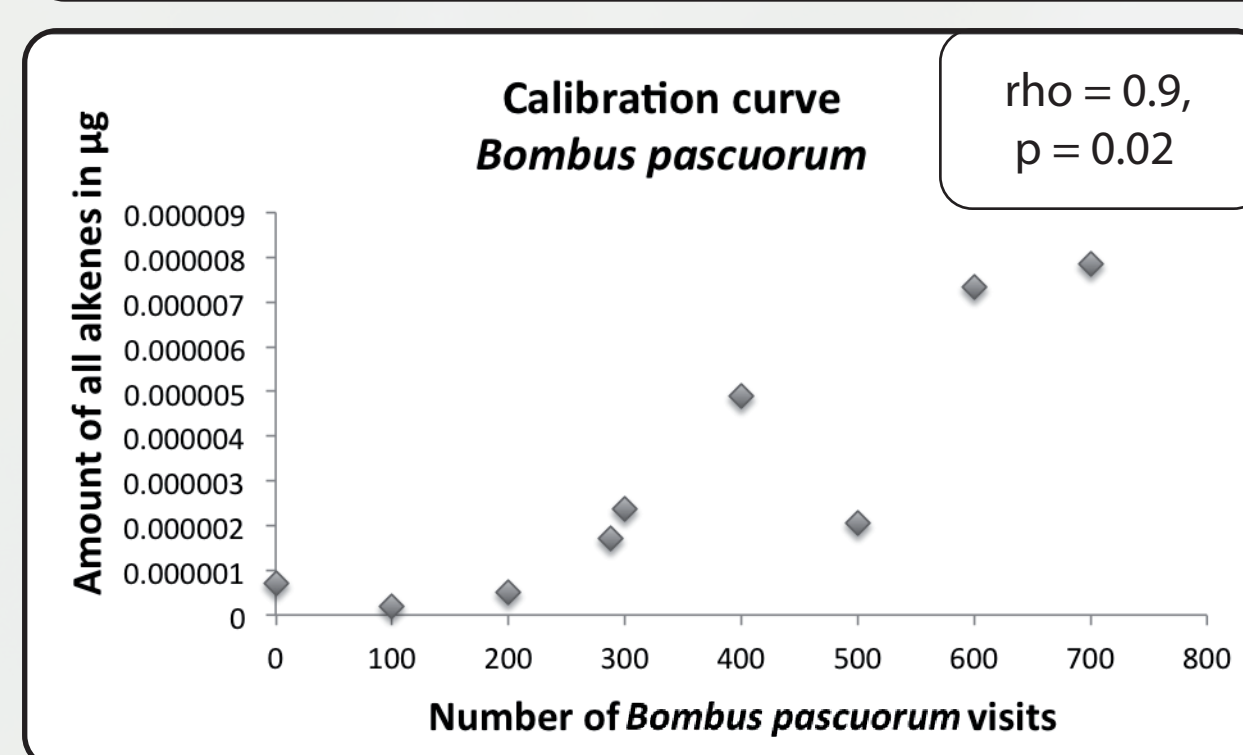
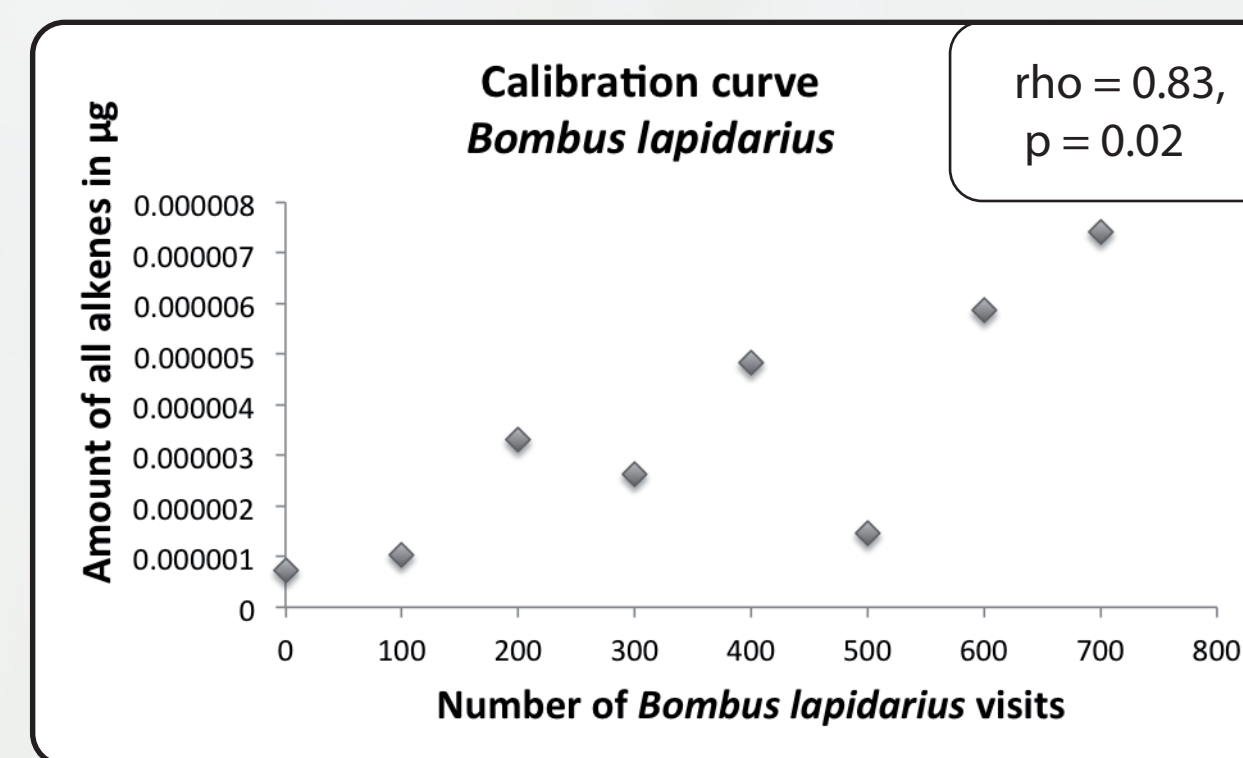


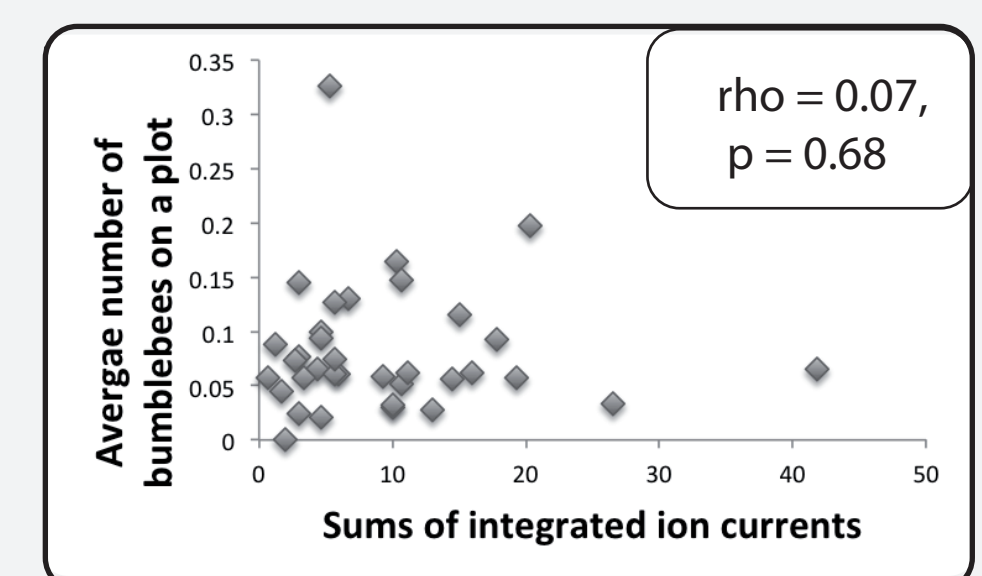
Figure 1: Calibration curves showing a strong positive correlation between the number of allowed bumblebee visits and the amount of alkenes found on white clover inflorescences.

Results

- No significant correlation between bumblebee footprint and conservative census data

In more detail: No correlation between the amount of alkenes found in the extracts and ...

...the average number of bumblebees on a plot.



...the average number of bumblebees on *T. repens*.

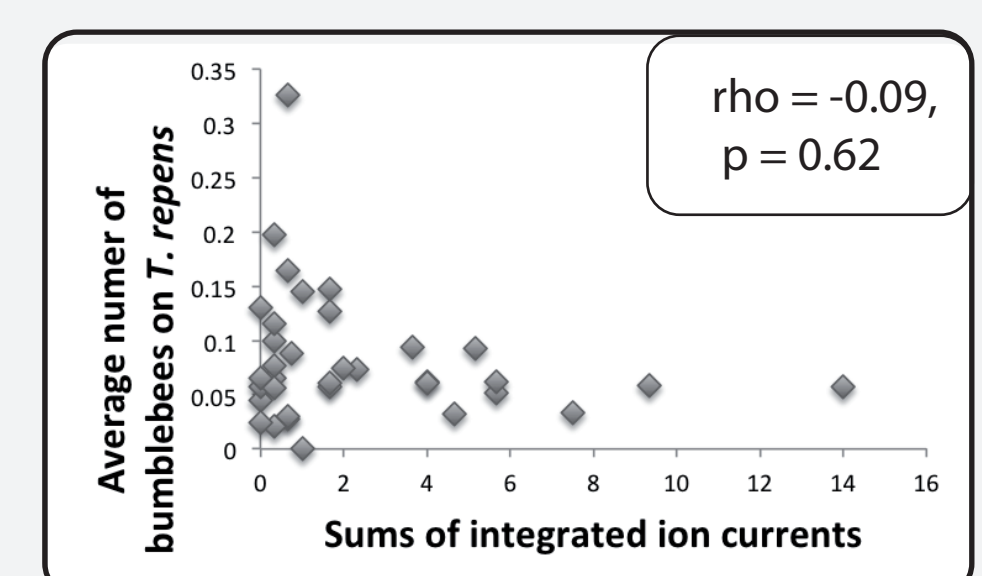


Figure 3: Correlation between census data and footprint data.

Are census data and bumblebee chemical footprints suitable to assess flower visitation of bumblebees?

Material and methods

- 46 grassland plots (50x50m) in the Schwäbische Alb, Germany
- Census data from three visits per plot (morning, midday, afternoon, 80 min each)
- Extraction of a pooled sample of 15 *Trifolium repens* inflorescences per plot after the afternoon visit of that plot

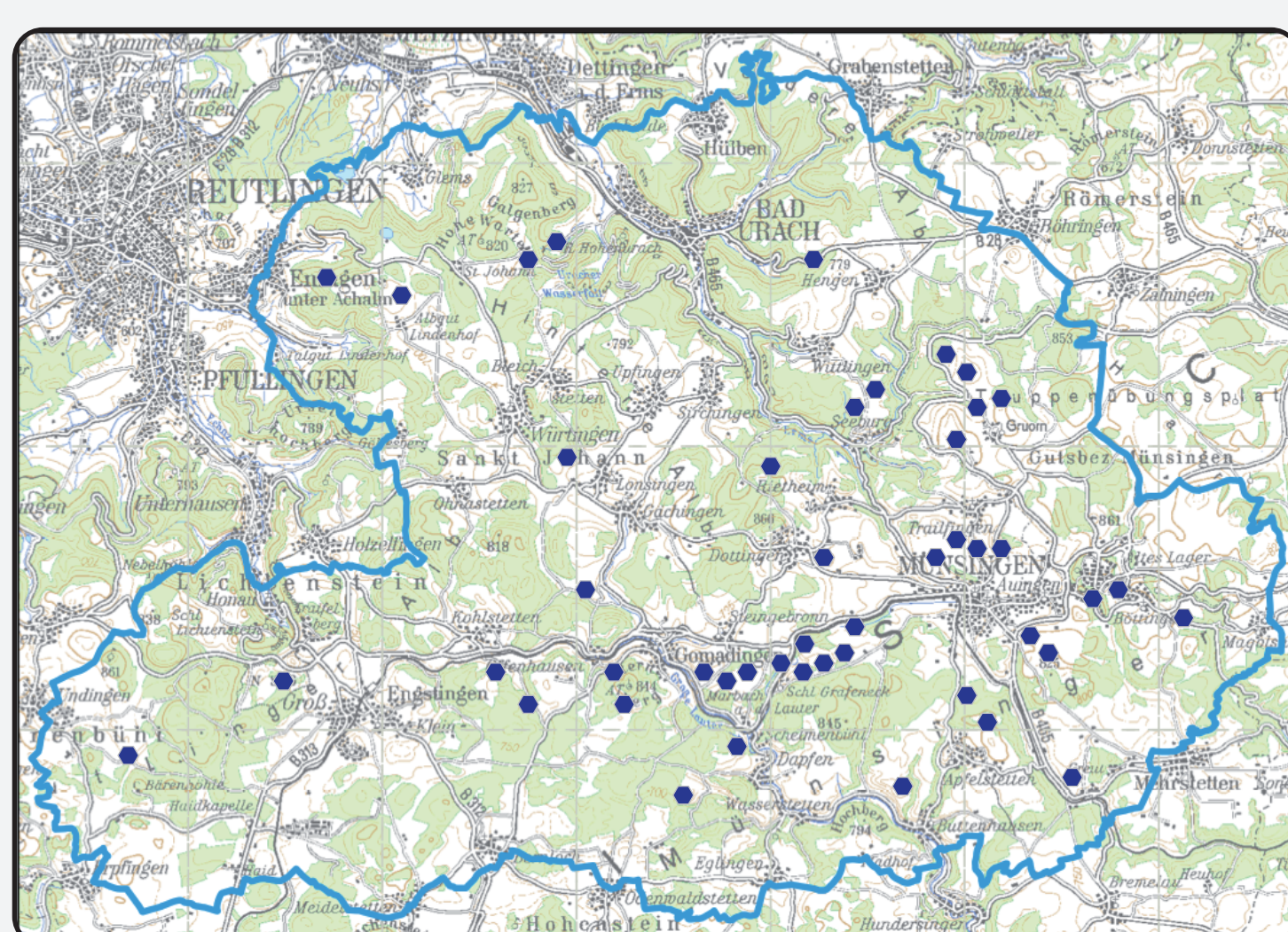


Figure 2: Map of the Schwäbische Alb. Project and plots are part of the Biodiversity Exploratories (DFG funded research project).

Discussion

- 3x80 min census not sufficient to quantify flower visitation rate on a plot level
- Footprint sampling less time intensive, up to 15 plots can be surveyed per day

➔ Footprint data are more efficient to quantify bumblebee visitation

Census and bumblebee chemical footprints lead to different results. Footprints seem to be a better indicator for flower visitation of bumblebees.

Outlook

- Verifying the footprint method with more calibration curves (e.g. *Trifolium pratense*, *Lotus corniculatus*)
- Verifying the field suitability of the footprint method with more plant species
- Comparing two samples from the same plot to see if a pool of 15 inflorescences is sufficient
- Using footprint data in a large field experiment to investigate how domesticated honeybees and land-use intensification influences the flower-visiting behaviour of bumblebees



About the author:
Wiebke Kämper is a PhD student at the Ruhr-University Bochum. She is interested in pollination ecology and invasive species.
E-Mail: wiebke.kaemper@rub.de



IUSSI stay funded by

