

## Exposé of BioMove Joint Experiment

### “Mobile linkage between high diversity patches in homogeneous agricultural landscapes – The Linde Experiment”

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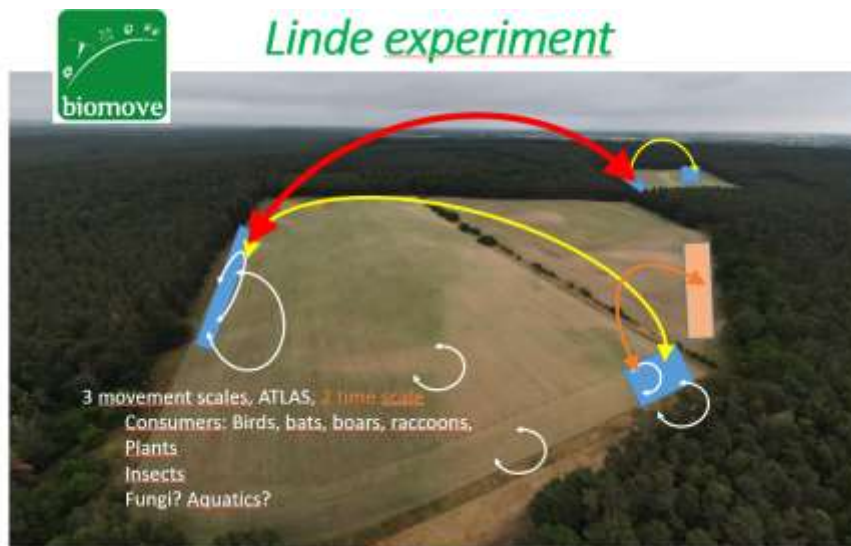


Figure 1: Wildflower areas (blue) in wheat fields embedded in a forest matrix in the Linde experiment, and different movement scales (colored arrows, aerial: Marcus Wicke, Zwillenberg-Tietz foundation)

### Scientific background, the “mobile link”

As a concept, many animals function as “mobile linkers” in ecosystems, connecting sites (“genetic linkers” among populations), transport changes among sites and ecosystems (“process linkers” affecting other species, “nutritional linkers” transporting nutrients and matter) and thus affect biodiversity of these sites (Lundberg and Moberg 2003).

Meanwhile, biodiversity levels at the sites, and diversity differences among sites and matrix may feedback on the mobility of the linker. Further, a high biodiversity at a site may increase the ecosystem functions such as pollination, beauty, pest control... at a site, or to the benefit of the surrounding matrix. These are typical arguments for the establishment of wildflower strips in a species-poor agricultural matrix (e.g. Ganser et al. 2019, Eccard 2022), which on the other hand are increasingly criticized as ecological traps for less mobile species.

In the Linde experiment, we can study these processes. We can monitor the biodiversity of mobile linkers themselves, their mobility within, among sites and into the matrix, and we may be able to study contributions of mobile linkers attracted to biodiverse wildflower areas to ecosystem function.

## Experimental Set-Up and Logistics

The experiment is conducted 2021-2024 at the Station Linde, 60km west of Potsdam, kindly hosted by the Zwillenberg-Tietz Foundation. Station Linde can support researchers in the project with logistics and accommodation. <https://zwillenberg-tietz-stiftung.de/forschungsstation-linde/>

The Linde experiments offers a platform to study mobility of animals by manipulating the biodiversity of plants. On five 8ha-20ha large wheat fields, embedded in a coniferous forest matrix, ten small wildflower windows (0.3ha) are established at the field margins, offering a diverse plant island embedded in a matrix with a low plant diversity (Figure 2). In the second and third year, the biodiverse islands will age (species succession) and more islands (5 per year) will be established. With differently aged islands run in parallel, the gamma diversity of the island system, and the beta diversity within the island system will rise every year. The first cohort of biodiverse elements (island) was sown in autumn 2021 and will start flowering in spring 2022.

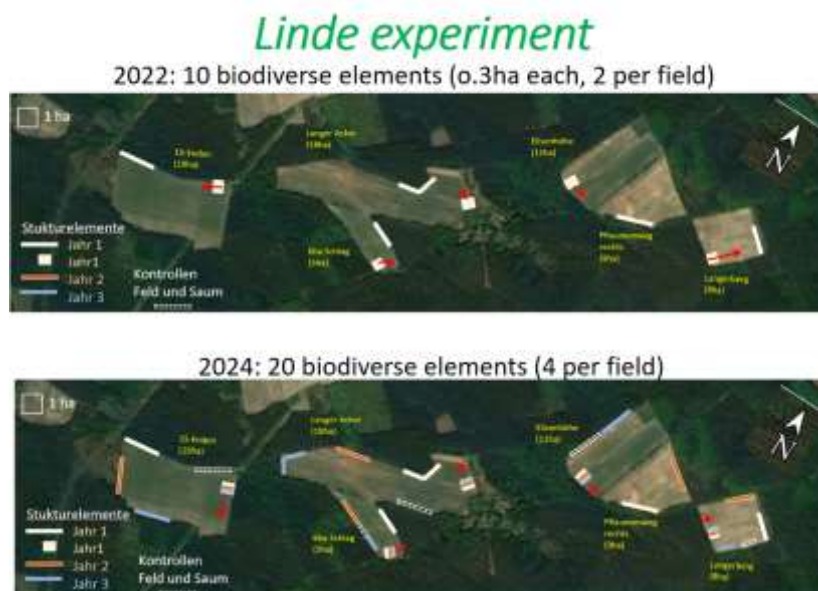


Figure 2: Spatio-temporal set-up of planted wildflower elements in an agricultural and forest matrix in the Linde Experiment

## Work packages

### WP1: Biodiversity cascades

Question: How does biodiversity of plants affect local presence/absence of animals and potential mobile linkers? By increasing plant biodiversity, herbivores and pollinators may also be attracted, as well as their predators. These biodiversity-driven cascades may potentially facilitate mobile linkage. Thus, monitoring of animals, and an analysis of functional mobility traits of the organisms inhabiting biodiversity islands should be analysed. Using the setup of the Linde Experiment, biodiversity of potential mobile linker species can be compared between experimental wildflower areas, and to controls in the wheat fields or forest matrix.

For this package researchers are needed that are interested in monitoring, collecting, and identifying different animal taxa (Birds, Bats, Spiders, Lepidoptera, rodents, ....etc). Vera Kaunath, the PhD student in the Linde Experiment, will herself focus on *Coleoptera* and *Heteroptera*, and Vera supports and

coordinates sampling operations of interested collaborators. Please contact [VKaunath@web.de](mailto:VKaunath@web.de) if interested.

Potentially, diversity estimates of cryptic taxa (e.g. soil organisms) can be compared using metabarcoding in the Molecular Ecology Lab of the AG Tiedemann. Please contact [eccard@](mailto:eccard@uni-potsdam.de) and [tiedeman@uni-potsdam.de](mailto:tiedeman@uni-potsdam.de) if interested in lab work and biodiversity.

### *WP2: Ecosystem functions*

How does biodiversity of plants indirectly affect the ecosystem functions of mobile linkers?

Ecosystem functions we identified to investigate are:

- Terrestrial-aquatic coupling, colonization of water bodies. Here we will provide artificial, experimental mesocosms filled with tap water at wildflower island and control sites, and monitor their visitors (cam traps). We expect more visitors (drinking or breeding) at the wildflower islands, and an a different dynamic and diversity at the emerging plankton population that was transported to the mesocosms by mobile linkers. For this experiment we already teamed up with Julia Pawlak und Guntram Weithoff for Summer 2022.
- Decomposition of organic matter. Here we could for example provide experimental organic matter at wildflower islands and field or forest control sites, and monitor the decomposer community as well as the dynamic process of decomposition. For this experiment we would need interested researcher collaborators, with a fable for dung beetles, wood decomposers, or burying beetles. The experiment may also be conducted as a Masters thesis/project module. Please contact [eccard@uni-potsdam.de](mailto:eccard@uni-potsdam.de) if interested.
- Many other. Be creative! Investigate pollination in experimental flower pots?

### *WP3: Movement ecology of mobile linkers*

While WP1 and WP2 describe the patterns emerging through the activities of mobile linkers, WP3 aims to understand the movement of the linkers themselves. Questions include

- spatio-temporal patterns how experimental diversity islands are colonized
- Metapopulation dynamics and exchange among diversity islands
- Spatial scale of different terrestrial and areal linkers within and among diversity islands, and fields.

*For this package we need researchers with expertise in different animal taxa (bats, birds, small and medium sized mammals, large insects...) that are interested in a trapping-tagging-tracking exercise using the available, automated tracking systems (ART (AG Eccard) or ATLAS (BioMove, AG Jeltsch)). Note that permits have to be organized (ca 6-9 months before the field work) and tags ordered well in advance.*

## **References**

Lundberg, J., Moberg, F. Mobile Link Organisms and Ecosystem Functioning: Implications for Ecosystem Resilience and Management. *Ecosystems* **6**, 0087–0098 (2003). <https://doi.org/10.1007/s10021-002-0150-4>

Ganser, D., Knop, E., Albrecht, M. Sown wildflower strips as overwintering habitat for arthropods: Effective measure or ecological trap? *Agriculture, Ecosystems & Environment*, 275, 123-131,(2019) <https://doi.org/10.1016/j.agee.2019.02.010>.

Eccard, JA Can rolling composite wildflower blocks increase biodiversity in agricultural landscapes better than wildflowers strips? *Journal of Applied Ecology* (in the press)