



German Centre for Integrative **Biodiversity Research (iDiv)** Halle-Jena-Leipzig

## sDiv working group meeting report "sFragment"

Assessing how the relative impacts of landscape fragmentation, compared to habitat loss, affect functional diversity and its connection to species richness across spatial scales remains a complex challenge. Our working group (*sFragment*) is tackling this issue by employing a spatially explicit, multiscale, and reproducible framework that integrates information of plant and bird communities sampled in multiple landscapes from different regions of the world. Our framework draws on the expertise of a diverse group of researchers with many years of experience that provide a wide range of expertise across functional ecology, community ecology and landscape ecology. Our group includes researchers that have worked in different countries from the Global South and the Global North. We are at different career stages, ranging from a master student to a Professor, including eight early and mid-career researchers holding a PhD degree. English is the second language for eight out of the 10 members (5 women and 5 men).

During our first meeting in June 2024, we focused on developing a trait-explicit framework that considers spatial scale as a determinant for the direction (negative, positive or neutral) of fragmentation effects on biodiversity. Our framework emphasizes the importance of the underlying trait distribution of the regional species pool and highlights the utility of focusing on particular trait combinations to predict fragmentation responses across different scales. We also explore how interactions between species and the landscape matrix can generate distinct hypotheses regarding the impacts of fragmentation on biodiversity. The diverse background of our working group will allow us to demonstrate how our framework can be applied to different taxonomic groups with distinct suites of traits to generate hypotheses regarding fragmentation effects on biodiversity. Our analysis is also helping us to highlight biases in current fragmentation studies and propose a research agenda to advance the understanding of multiscale fragmentation effects on ecological communities. A perspective piece developing a general framework is currently under development. This perspective will help to generate some clear hypotheses that we will test using global datasets in the second part of the project.

The overall feedback for the meeting was highly positive, with participants expressing satisfaction across several aspects including time management and flexibility, proper division of tasks and responsibilities among team members, and balance of speaking time



among participants. Rather than having presentations each day with specific topics, we focused on discussing different aspects of our framework. In particular, we spent most of our time in generating testable hypotheses of how fragmentation/functional diversity relationships change in fragmented landscapes at multiple scales. Attendees also highlighted the diversity of disciplinary expertise, which enriched the discussions and fostered a multidisciplinary approach to our perspective piece.

The goal of our second in person meeting is to integrate multiple sources of data to quantify the relative effects of habitat loss and fragmentation on landscape-level and patch scale taxonomic and functional diversity. We will focus forest dependent species belonging to two taxonomic groups: plants and birds. We have chosen these groups because they are relatively well-sampled compared to other taxonomic groups. In addition, we are highly familiar with databases used to describe macroecological patterns of these species (eBird data (for birds) and sPlot (for plants)). Focusing on forest-dependent species will also allow us to measure landscape and patch metrics more easily and will avoid issues associated with analyzing habitats where landscape structure is more difficult to quantify. Most input data for the project is already available as the project will leverage off access to state-of-the-art datasets, prior experience from group members managing big data and the necessary cloud computing.

Over the next six months, we will have monthly virtual meetings to adjust our workflow to filter local assemblages from georeferenced datasets, define the extent of the landscapes analysed for each assemblage, quantify the amount of habitat (in our case forest) available in each landscape, quantify landscape metrics at landscape and patch scales, and compile trait data from available datasets. This information will be used to quantify functional diversity metrics and taxonomic diversity at patch and landscape scales during our in-person meeting. We hope to use these analyses to generate a scientific article in a high impact journal that will a) show the relative effects of habitat loss and fragmentation on landscape-level and patch scale functional diversity globally and b) Test if the shape of the trait distributions in the species pool at regional scales is a good predictor of the effects of fragmentation on functional diversity at landscape and patch scales.