sDiv working group meeting report

"sMars: Synthesis of movement across scales: towards a process-based prediction of biodiversity patterns"

Project 1: Movement database

General aim: One of the primary objectives of the sMars workshop was to create a comprehensive movement database that consolidates all available data on animal movement. This database aims to encompass essential movement processes such as dispersal, migration, and foraging/home range behavior, as well as various movement measures including distance, speed, and area.

Progress: Between the two workshops, PhD student Caitlin Wilkinson made substantial contributions to the expansion of the database, resulting in a significant increase in its scope and content. In the second workshop, we provided an update on the progress of the database and addressed any questions or issues that arose. Furthermore, the team identified crucial gaps in the database that should be addressed and filled in prior to the third workshop (e.g., geographic location), ensuring its comprehensiveness and usability.

Next steps: We will continue to fill in the data gaps with the help of a student helper to have a final version of the database ready by the start of the third workshop.

Project 2: Concepts of trait-based spatial scale

General aim: The conventional definition of geographic spatial scales (micro, meso, and macroscale) often stems from an anthropocentric viewpoint, which may not align with the actual scales at which different species live and interact. Consequently, research conducted within a given geographic area may blend processes operating at various species-specific scales. Recognizing this discrepancy, one of the primary objectives of the sMars working group was to develop a concept that adopts a more species-specific and trait-based perspective on spatial scale, centered around the movement capacity of organisms (Concept 1). During the first workshop, the group also developed the idea to transform this trait-based scale from an absolute scale to a relative scale, enabling comparisons across different species (Concept 2). This approach involved predicting a potential lifetime movement distance based on a movement speed model and allometries of average lifespan, and subsequently scaling all movement processes relative to this distance. As a result, new standardized allometric scaling relationships for various movement processes were derived.

Progress: During the first workshop, the group extensively discussed these concepts and explored their potential applications. Preliminary figures were produced, and an outline for the papers was established. By the beginning of the second workshop, an outline of the papers and the most important paragraphs had been completed. In the second workshop, we discussed the progress and possible applications.

Next steps: We scheduled a writing retreat for September to complete the concept papers on spatial scale.

Project 3: Dispersal model

General aim: In addition to the discussed topics, the group also dedicated time in the second workshop to the development of a dispersal model, which was initially conceptualized during the first workshop. The primary objective was to create a mechanistic energy-budget model capable of predicting realized dispersal distances based on various energy costs (e.g., metabolic costs and movement costs) and energy gains (e.g., feeding rates and prey density) derived from traits and environmental conditions.

Progress: A first version of the dispersal model was developed by PhD student Caitlin Wilkinson under the supervision of Remo Ryser and Myriam Hirt between the workshops. In the second workshop, we discussed the model, open questions, and possible applications. We developed the idea to integrate this more realistic dispersal model into the species distribution models developed and utilized by working group member Carsten Meyer and his team.

Next steps: The model requires some fine-tuning before it can be applied, and the plan is to complete this process before the start of the third workshop, ensuring that the model is ready for further investigation and analysis.

Project 4: Human impacts on home range size

General aim: During the second workshop, the group extensively discussed the examination of human impacts on home range sizes and their potential mediation by body size. The idea emerged to combine the movement database and modeling techniques to test these impacts. To pursue this research, the group divided into two subgroups: one focusing on the empirical (database) aspect and the other on the theoretical component. The main hypothesis posits a size-specific response in home range size to human impacts, attributed to varying experiences of the landscape's granularity based on body size. The objective is to integrate their findings into a cohesive paper.

Progress: The empirical subgroup discussed how to merge home range data from the movement database with remote sensing data on food availability (provided by Carsten Meyer). Their aim is to investigate if there are size-specific differences in the response of home range area to human impacts. Meanwhile, the theoretical subgroup developed a null model to simulate diverse landscape configurations of human impact. By systematically modifying the granularity of the landscape, they will calculate the average experienced human impact depending on body size. This approach will first highlight and simulate a potential mechanism that could lead to distinct size-specific responses in home range size to human impacts. The empirical data from the movement database will subsequently be used to test this mechanism.

Next steps: At the end of the second workshop, tasks were assigned among the working group members, and leadership roles were established to ensure a smooth progress in the respective tasks.

General atmosphere and sDiv support

The workshop had a highly inspiring and open-minded atmosphere, promoting productivity and fun. We successfully developed new project ideas while maintaining focus on our main objectives. We are excited that the movement database developed in the first workshop found practical applications. The decision was made to continue the workshop beyond the funding period, with the group committed to working intensively between workshops. The support provided by sDiv was excellent, and no major problems occurred. Overall, the workshop fostered a positive and collaborative environment, allowing for significant progress in our work.

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