

sDiv working group meeting summary

"sPRINT: Working out the mechanics of predator-prey interactions to predict the present and future of biodiversity in food webs"

Capitalizing on the 1st sDiv meeting, the working group met for another week of brainstorming and discussion around the role of physical factors in predicting predator-prey interactions within their environment. All the ingredients necessary for the explicit inclusion of such physical factors had already been identified at the previous meeting: one needs a definition of individual movement (provided by Nathan et al 2008), a description of the various steps of the predation sequence (as in Wootton et al 2021) and adequate methodologies to first, describe how a given physical factor affects the components of movement; and in a second stage, the various degrees to which the components of movement are involved in the various steps of the predation sequence. We thoroughly discussed the methodologies and came with satisfying answers. Each step in the predation sequence corresponds to a different internal goal for the predator and the prey. It also sets which of the navigation and motion capacities that the organism possesses that will be of use. The physical conditions affect the efficiency with which those capacities are used by the predator and the prey to reach their internal goal.

Based on this methodological breakthrough, we reorganized the review started during the first meeting, first meant to present evidence for the important role of physical factors in shaping predation in various environments, into a framework for the explicit inclusion of such factors into models of predation, and eventually into models of food webs.

In the second part of the workshop, we moved beyond the review to think about future prospects. We defined four topics that could potentially be developed into full-fledged research projects:

- The design of experiments to test the framework developed by the group. The overall principle of such experiments would be to manipulate one specific physical factor, quantify how the components of the movement of individuals are affected, and measure all the steps in the predation sequence.
- Make use of the numerous databases on functional responses (e.g., [FoRAGE](#)), in order to explore the link between the parameters of the functional response, the physical conditions in which the response was measured, and the morphological traits of the prey and predator involved.
- Explore trait databases in order to extract intrinsic movement traits of organisms and relate them to the same traits measured in various environmental conditions, in order to show how realized traits are defined by the interaction between intrinsic traits and physical factors. Also, reach the evolutionary scale, by linking differences between the intrinsic traits of species to changes in physical dimensions of their ecological niches.
- Find appropriate models of movement paths that allow for the inclusion of the effects of physical factors, and the concomitant calculation of energy expenditures.



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The meeting closed down with these perspectives in mind. A draft of the review was made available on the cloud, and tasks were distributed among the participants for its completion. Projects along the lines defined above are in development until next meeting.

In conclusion, this meeting proved very productive, mostly because the focus was from the start on closing the gaps in the framework sketched during the first sPRINT meeting. The framework thus constructed proved a solid basis for the development of research projects meant to further the study of the role of physical factors in trophic interactions.