

## Sabbatical Report for sDiv sabbatical position

*When chance matters: incorporating ecological drift and alternate stable states into predictions for the spatial distribution of species diversity*

Benjamin Gilbert. September 1 – December 21, 2017

Overview:

My sDiv sabbatical visit spanned 3.5 months, and provided excellent opportunities to interact with postdocs and permanent scientists at sDiv and iDiv. My overarching goals for the sabbatical were threefold: (1) to develop research, in collaboration with iDiv scientists and postdocs, on the topics of ecological drift, functional diversity and alternate stable states; (2) to interact with iDiv scientists and postdocs, with the goal of learning from and contributing to the synthesis and theory being developed; and (3) to maintain my research in Canada, and specifically to provide my students and postdocs with the support necessary to continue their ongoing research. The sabbatical was successful for all goals, but the goals themselves necessitated some trade-offs that were more challenging than anticipated. I outline the successes and challenges of each goal below, and conclude with work remaining.

### **Goal 1: Develop research, in collaboration with iDiv scientists and postdocs, on the topics of ecological drift, functional diversity and alternate stable states.**

In September, sDiv funded a small working group through my sabbatical. The theme of the working group was, “Ecological Drift and Functional Diversity”, and the group included eight scientists: Florence Debarre (CNRS, Paris), Lauren Shoemaker (University of Minnesota), Nathan Kraft (UCLA), myself, and four iDiv scientists: Thorsten Wiegand, Stan Harpole, Alienor Jeliaskov, and Jonathan Chase. The group ran from Sept. 25-27, with an additional informal meeting on Sept. 24.

The working group had to overcome two important challenges, one of which shifted the focus of the group. The first of these challenges was to clearly separate the factors that cause ecological drift from other forms of stochasticity. For example, a previous working group had developed a paper on stochasticity in community ecology (Shoemaker et al, in review, SNIche working group), which identified and described the effects of different forms of stochasticity, including demographic and environmental stochasticity. These distinctions among sources of stochasticity, as well as distinctions made by population ecologists, were not generally accepted by the members of our group, and thus converging on a shared vision took considerable work. The second challenge involved moving from community ecology theory based on population demographics to community ecology theory based on functional traits; while demographic stochasticity and ecological drift necessarily deal with the former, our group was also interested in its impacts on functional diversity. This second challenge is not

confined to our working group – it is a major but elusive goal for empirical and theoretical ecologists. Due to the limited time available, the group focused on the first challenge, recognizing that it would require its own synthesis and publication before it would be possible to address the second challenge.

**Successes and work remaining.** The working group was successful in developing a conceptual model of ecological drift that I think will be broadly appealing to ecologists. This model is the basis for a collaborative paper that is currently in development, but that may require a future ‘writing meeting’ to complete – many of the ideas that we raised during the working group are germinating in the paper, but we did not foresee their full implications and may need a concentrated period of time to work on them together. For example, I have completed a theoretical integration of how random dispersal within communities generates demographic heterogeneity (tying together research on ecological drift with Thorston Wiegand’s research), and have taken the first steps in integrating demographic stochasticity into priority effects and coexistence. Each of these makes up one component of our conceptual paper, yet the separate components require integration.

**Goal 2: interact with iDiv scientists and postdocs, with the goal of learning from and contributing to the synthesis and theory being developed.**

I was very pleased that I was able to benefit from, and contribute to, several formal and informal opportunities to interact with sDiv and iDiv scientists and postdocs. In my first month at sDiv, iDiv had its annual conference (Sept 19-20, 2017). This conference was an ideal introduction to iDiv and the range of research its scientists conduct. Through a last-minute cancellation, I was also able to present at the conference, which I believe gave many iDiv scientists who are not in my field a taste of the type of research and questions that I find interesting. A second planned event, the writing retreat that took place in December (Dec. 6 – 8, 2017) provided a more intimate milieu to discuss research with a broader group of postdocs than I interacted with on a daily basis at sDiv. Finally, the weekly seminar series provided a fantastic window into the research and working groups that sDiv supports.

Apart from these formal interactions, there were a number of discussion groups and casual conversations that facilitated my integration into sDiv. For example, the half-baked café, organized mainly by postdocs, was a great forum for discussing and developing ideas. Similarly, lunches with postdocs and staff scientists often involved periods of discussing specific research topics and challenges. Although I am broadly interested in much of the ongoing work at iDiv, I interacted mostly with Jon Chase’s group during these informal chats (e.g., Alienor Jeliaskov and Duarte Viana) because of my familiarity with their research questions and approaches.

**Goal 3: maintain my research in Canada by providing my students and postdocs with the support necessary to continue their ongoing research.**

I raise this goal because it is likely common to all sabbatical fellows, and necessitates a trade-off with the research that can be done at iDiv. Apart from the obvious challenge of managing limited time, the need to interact regularly with students and postdocs at my home institution created a logistical challenge that prevented me from taking part in some of the activities that facilitate interactions. For example, the half-baked café and many of the discussions surrounding insect declines globally occurred in the afternoons, and the difference in time zones between Canada and Germany meant that the afternoon was the only window for skyping with students and postdocs.

**Suggestions for future sabbatical fellows**

Overall, I felt that the systems in place for sDiv sabbatical fellows were excellent. For example, Marten Winter and Jon Chase suggested that I host a small working group early on during the sabbatical so that the ideas of the working group were not lost. This recommendation was excellent, and helped me switch gears from simply working on previous research to focusing on my research goals while at sDiv. My only regret with my sabbatical at sDiv was that I did not spend longer at the institute, as I underestimated the amount of time required for interacting with my students and postdocs, which cut into my research goals while at sDiv.