

sDiv working group meeting report

sTime

Working group meeting report

This 2-pager will be published on our website. It is meant to inform and update the sDiv board, the iDiv community and the public about your project and the activities and general progress you made at your meeting. But exclude the internal, especially not finished ideas and analyses etc. This report should also give some insights how synthesis group meetings are structured and which activities are usually happening at those meetings.

The following information should to be included and very briefly described:

- *focal areas of discussion + main results/conclusions + open questions*
- *content of presentations*
- *general research ideas, questions & directions discussed (incl. potential data to be used etc.)*
- *general structure of the week (break out groups, presentations, sessions with remote participants etc.)*
- *next steps & upcoming deliverables*
- *general working atmosphere and feedback on sDiv support (What kind of support? How helpful was it?)*

The first [sTime](#) working group met from 08 to 12 April, 2024, to examine the dynamics of biodiversity change at the local, assemblage scale across temporal scales and provide the theoretical and analytical foundation needed to jump-start research across the modern/ancient divide. Global biodiversity appears to be changing so fast that many fear we are on the brink of mass extinction today. Testing whether this is true, however, requires understanding the variation in rate and extent of biodiversity change through time. The fossil record offers a way to quantify this variation, yet it is difficult to directly compare modern and ancient dynamics due to differences in the type and scale of observations. sTime is providing the integrative theoretical and analytical framework needed to compare ecological dynamics across temporal scales.

The first meeting of sTime included most team members and used a nested, breakout group structure to build the sTime community and to develop specific targets (questions & approaches) for the project. During the workshop, we focused on three goals: developing the theoretical and modelling framework; exploring the practical limitations/gaps in the data and therefore developing targets for the BioDeepTime database expansion; and refining the statistical and time-series approaches for data-model comparisons.

We hosted 19 in-person attendees and four remote participants. In person attendees hailed from 6 different countries and 15 different institutions. Each in-person member of the workshop was given a task to facilitate participation. Tasks included moderating discussion sections, taking notes of the sessions, monitoring the online chat, facilitating remote participation on Zoom, and leading the breakout group discussions.

The first day of the meeting was dominated by short talks to introduce key concepts relevant to sTime goals. These talks included an introduction to bias and scaling in paleontological

records, an introduction to error in diversity estimates, an introduction to eco-evolutionary models, and an introduction to the BioDeepTime database.

The BioDeepTime data will underpin most empirical analyses for sTime, so we also included a short exercise to familiarize participants with the database structure using the R programming language. At the end of the first day, we introduced the three main breakout groups that would tackle the aims of the meeting: developing the theoretical and modelling framework (evo-evo breakout group); exploring the practical limitations/gaps in the data and therefore developing targets for the BioDeepTime database expansion (data breakout group); and refining the statistical and time-series approaches for data-model comparisons (statistical breakout group).

The second day of the meeting began with talks to introduce previous work of relevance to sTime goals, including species-time relationships, spectral analyses of climate and communities, and work using eco-evolutionary models. After lunch, we transitioned to an entire-group discussion on recent, relevant literature and on brainstorming ideas for future projects.

The remaining two and a half workshop days included a mixture of breakout group work and entire-group discussion on the progress and ideas that arose in the breakout groups. Each of the working groups created and contributed to a living Google document that recorded the discussions, aims, and next steps.

During the course of the workshop, sTime participants developed and agreed upon five initial projects that will be advanced by the group:

- (1) The ‘data’ working group will lead on writing a funding proposal that is needed to curate and add additional data to the BioDeepTime database. The initial target for data acquisition will be deep time timeseries (Phanerozoic scale from the GBDB, PBDB) and shorter, historical conservation paleobiology timeseries.
- (2) The ‘stats’ working group will analyse how changes in diversity over geologic time are dependent on spatial scale by comparing regional (gamma) and local (alpha) diversity change. The lead on this project will be Ben Shipley and Zachary Miller.
- (3) The ‘eco-evo’ working group will run a new suite of simulations using the gen3sis modelling software, which will ask whether biotic interactions are ever important in structuring diversity dynamics under differing rates of climate change. The lead on this project will be Wyatt Petryshen.
- (4) The entire group generated two ideas for review-style papers that will be produced during the course of sTime. The first of these projects will discuss how rates scale with time, and the problems that rate scaling pose for comparing modern to historical rates. This paper will be led by Pincelli Hull.
- (5) The second review paper will discuss how biological processes are distributed across scales of space, time, and biological levels of organization. The paper will discuss the necessary conceptual framework to build, evaluate and communicate theory and mechanistic models of biodiversity. This work will be led by Thiago Rangel and Maya Samuels-Fair.

Work on these five projects will continue over the course of the next year. The identified leads will push forward the projects, with help from a subset of sTime participants (approximately 10 per project) who volunteered to be involved. All sTime participants will meet on a regular basis (once a month or so) to discuss progress, troubleshoot issues, and set future work goals.

Our sTime working group aimed to foster an inclusive, supportive, and friendly working environment, where ideas could be shared freely. We aimed to solicit active participation and discussion from all in-person and remote attendees. The inclusive atmosphere was facilitated by the environment and resources available at iDiv. Our working group was provided with all necessary advice and equipment needed for a successful meeting, including help on designing and scheduling a supportive workshop atmosphere, and space for our breakout groups to brainstorm ideas.