

## sDiv working group meeting summary

### "sCap - Testing the conservation value of phylogenetic diversity"

"Testing the Conservation Value of Phylogenetic Diversity" (sCAP): The first full meeting of this working group was held in Leipzig in early December, following on from a small initial meeting held in Ottawa Canada in early September co-sponsored with the Canadian Institute for Ecology and Evolution (CIEE). The atmosphere was collegial and collaborative, with the mostly early career ecologists, evolutionary biologists, and paleontologists hailing from Argentina, Canada, France, Germany, Italy, Singapore, Spain and the UK. On day 1 we worked to focus the questions we wanted to test (50% of time), interspersed with a fair number of short presentations (50% time) meant to establish the state of the literature. The remaining days were divided between small group work (50%), discussions (30%), and brain-storming (20%).

The attendees focused on the central question of what phylogenetic diversity (or PD) might offer to conservation activities. A first draft of a conceptual diagram around which to structure this question had been developed during the earlier CIEE meeting. This figure linked phylogenetic diversity with its important covariates: functional diversity, extinction risk, ecosystem functioning and services, and future diversification. Each day the entire group continued to chip away at the draft figure, coming to grips with what the literature argues that PD offers conservation biology, which arguments are testable, which have been tested, and which pass or fail. Though initially rejected in favour of empirical tests, ongoing discussion suggested that a synthesis paper that highlights each of these linkages/arguments might be useful, and this task will be begun at the second meeting of the group.

On the first day, presentations cast light on the existing literature and the support for each linkage in the draft conceptual diagram. Marc Cadotte presented his research supporting the link between ecosystem function and PD. Rich Grenyer provided a thoughtful discussion about what "option value" means in terms of PD and functional diversity (FD). Caroline Tucker and Florent Mazel then presented the result of their analyses started at the earlier CIEE meeting. Both presented simulations of the expected relationship between functional diversity (convex hull) and phylogenetic diversity under (different) particular models of trait evolution.

The meeting quickly focussed on a surprising observation from Florent's analysis, spurred from a prediction by Matt Pennell: it turns out that there are situations where—when selecting a subset of species—maximizing evolutionary history does worse than choosing species at random for

sampling a broad array of phenotypic diversity. Participants wanted to ask: do these situations represent commonly observed combinations of tree shapes and trait distributions? How often does the expectation of protecting more PD actually result in the protection of more FD? Two subgroups began looking at empirical data at various taxonomic and geographic scales (including within conservation reserves) to answer this question. These analyses, meant to produce two papers, were begun during the meeting and will be continued between the two meetings.

Another focus of the group was the value of “evolutionary potential” (EP) in arguments regarding PD and conservation. Broadly defined as the provision of feature diversity for the future, discussions of how to operationalize and test EP occurred over several days. The paleontologists in the group brought a number of excellent fossil phylogenies with which a sub-group asked whether choosing maximum PD sets of species in the past would do better than a random choice for predicting species diversity in the present. The data sets for these first four projects spanned foraminifera, hard corals, fossil horses, and bird and mammal families. Analyses began during this meeting in Leipzig, and are ongoing between meetings.

In the sDiv seminar, Danwei Huang spoke about his work on the evolutionary history of hard corals, and illustrated how evolutionary history could inform current conservation activities, and help us understand how clades had responded to past climatic changes. In another sCAP talk, Will Pearse presented work about his role coordinating a workshop on the EDGE program administered by the Zoological Society of London. This program focuses on conservation prioritization based on evolutionary distinctiveness (ED), and so was directly relevant to sCAP’s activities. Will agreed to report back on the outcomes of the EDGE workshop at the next sCAP meeting.

As anticipated, the thorniest link to test was that between PD and Ecosystem Services via Ecosystem Function. It was the opinion of many participants (following Sandra Diaz’ counsel) that ecosystem function is a context dependent measurement and can’t be understood except at the local scale. Our analyses focus on the regional scales at which prioritisation activities are likely to be occurring. Only brainstorming on this idea occurred at this meeting. We will return to it in the May meeting.

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