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INVITED COMMENTARY

TRY—A plant trait database of databases

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COMMENTARY ON "TRY PLANT TRAIT DATABASE – ENHANCED COVERAGE AND OPEN ACCESS"

TRY, the Plant Trait Database, has operated for 12 years and is progressing into its third generation. Kattge et al. (2019) provide an important overview and reflection on the past 12 years of the TRY database, with a discussion on future direction. At the time I write this, the TRY database lists 11,850,781 trait records, 279,875 plant taxa, and 214 publications (No Author, 2019; www.try-db.org) and is the main plant trait database used by researchers worldwide.

Plant traits express morphology, physiology, and behavior and are controlled by genetics, abiotic factors, and biological interactions. The foundation for plant ecology is based on the study of traits. How do traits correlate with fitness? How do traits change with climate? Do different species share similar suites of traits? Can we predict functional roles of ecosystems based on the set of traits expressed by the plants growing there? In addressing these questions, a widely applied approach is to ascribe and identify plant species by their traits. At the population level, changes in traits can be phenotypically plastic or an adaptation through genotypic differences. In communities, the use of plant trait measurements has led to many of our advancements in the understanding of plant ecology; for example, through the development of plant strategy theory (Grime, 1977), successional models (Van der Valk, 1981), and assembly rules (Keddy, 1992).

During the development of plant ecology theory and the increasing use of plant traits to drive theoretical understanding, individual labs around the world compiled their own separate trait databases. In many cases, plant traits were simply measured on a case by case basis as a cause and effect response in controlled experiments, or measured as correlational observations for, as example, environmental gradient studies. In other words, plant trait databases were developed through multiple and disparate studies designed to address individual, often regional, questions, with little coherent coordination between.

Perhaps the first lab group dedicated to a standardized approach to plant trait measurement was the Integrated Screening Program (ISP) at the Unit of Comparative Plant Ecology, University of Sheffield (Hendry & Grime, 1993). Forty-three species were selected for the measurement of 67 traits. The ISP was an important advancement, but was costly and labor intensive, and some of the selected traits required lengthy time commitments through experimentation.

Moving forward, researchers interested in plant trait–environment linkages instead focused on a small number of traits that were relatively easier and quicker to measure, and were more readily available as published variables in the literature. For example, Westoby (1998) selected only three key traits, specific leaf area, height of the plant's canopy at maturity, and seed mass, for the development of a plant strategy scheme. Díaz and Cabido (1997) analyzed 24 plant traits to test plant functional types and ecosystem function in relation to global change, focusing on plant traits that were easy to measure. It was during this period that research activity proliferated on linking key traits or easy to measure traits and their relationship with ecosystem function. It was also during this surge in research activity that networks in scientific research were starting to establish and develop at a global scale (Fraser et al., 2013; Wright et al., 2004).

Within this environment, the TRY database was conceived. TRY is an excellent example of one of the first coordinated distributed global databases, complete with an international steering committee and hundreds of contributors from dozens of countries. Important products very quickly emerged from the TRY consortium, including a formal launch manuscript (Kattge et al., 2011), and a global analysis of six major plant traits critical to growth, survival, and reproduction in relation to form and function from an evolutionary perspective (Diaz et al., 2016).

The overview paper presented in this issue (Kattge et al., 2019) comes at an important time in the evolution of the TRY database as it transitions into its third generation. In the first generation, the database was closed to the public, accessible by only those within the network. The second generation experienced an expansion of the database, primarily through contributions by small datasets, generating a "database of databases" (Kattge et al., 2019). In addition, a decision to allow controlled access to outside users in 2014 caused a dramatic rise in use (Kattge et al., 2019). The third generation follows current trends in science, data management, and data sharing, and is open to the public. Through open public access, I expect the TRY database to continue to influence research directions, motivate development of new measurements, and to assist in identification of data gaps, as it continues to grow its globally distributed coverage.

We have progressed from using simplified mean values of plant trait data to link traits to function or functional types. The next push is to increase geographic distribution of data coverage, especially in the tropics, and to increase data measurements to capture the intraspecific variation in plant traits at the species level, and even the genotype level. Increased detail in trait data variation will provide more accurate predictive models of plant–plant and plant–environment interactions.

The TRY database is critically important and groundbreaking in scope and intent. The most important environmental challenges are global in nature and so the proper approach to address these challenges is through international networks and data sharing. Knowledge gaps can be targeted with data, and with the organization of a global, georeferenced, structured trait database, our understanding of the environment and the global changes our world is experiencing can be addressed.

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