Data Papers

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The thermal dependence of biological traits

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Abstract. Environmental temperature has strong and systematic effects on biological processes at all levels of organization, ranging from cells to ecosystems. The large temporal and spatial variation in Earth's temperature creates a complex thermal landscape within which life evolves and operates. Here, we present a data set on how diverse biological rates and times respond to temperature, which we hope will aid in the search for general mechanisms of thermal dependence.

For nearly a century, intraspecific studies (within single species' populations) of thermal responses have been conducted on a wide range of organismal traits. Comparative studies of these data are essential for elucidating mechanisms underlying thermal response curves. However, such comparative intraspecific studies have been limited because of a lack of a comprehensive database that organizes these data with consistent units and trait definitions. Here, we present a database of 2352 thermal responses for 220 traits for microbes, plants, and animals compiled from 270 published sources. This represents the most diverse and comprehensive thermal response data set ever compiled. The traits in this database span levels of biological organization from internal physiology to species interactions and were measured in marine, freshwater, and terrestrial habitats for 411 species. Although we include some physiological rates, most data are for ecological traits, which we define here to mean any organismal trait that directly determines interactions between individuals within or across species.

We hope that publication of our data set will encourage others to compile complementary data sets, especially on individual physiology and life history traits. Intraspecific and interspecific (across species' populations) analyses of our data set should provide new insights into generalities and deviations in the thermal dependence of biological traits, and thus how biological systems, from cells to ecosystems, respond to temperature change. Such insights are essential for understanding how natural biological systems function, and how life is responding to Earth's complex and rapidly changing thermal landscape.

Key words: ecoinformatics; environmental driver; evolution; thermal response; temperature.

The complete data sets corresponding to abstracts published in the Data Papers section of the journal are published electronically in *Ecological Archives*: http://esapubs.org/archive (the accession number for each Data Paper is given directly beneath the title).

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