Metabolic rate variation among New Zealand Orthoptera

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Metabolic rates determine an individual's rates of resource acquisition, assimilation, growth, survival, and reproduction. In insects and other ectotherms, the resting body temperature corresponds to ambient temperature and the rate of biochemical processes increase rapidly with increasing temperatures. Q_{10} is a quotient that reflects the capacity of change in metabolic rate relative to changes in temperature. Q_{10} can be considered a measure of organismal performance as well as an individual attribute. Globally, researchers are focusing on the likely and predicted responses of insects to climatic changes in temperature, water availability, elevated CO_2 levels, and their interaction. A good starting point will be gathering original data on physiological traits of individual species. New Zealand Orthoptera includes representatives of six families, dominated by Anostostomatidae and Rhapidophoridae. In order to develop testable models about evolutionary drivers and likely responses to rapid anthropogenic climate change at the species level, we estimated variation in oxygen consumption (a proxy for metabolic rate). We targeted representatives of the genera *Hemideina*, *Deinacrida*, *Hemiandrus*, *Motuweta*, *Pachyrhamma*, *Talitropsis*, *Caedicia*, *Locusta*, and *Teleogryllus*. This is the first study to present data on the adult body mass for this set of Orthopteran. We aimed at measuring metabolic rate in representative New Zealand Orthopteran species to estimate the amount of extant variability; calculating Q_{10} for each individual to measure thermal sensitivity of metabolic rate; and comparing variation among species while inferring possible causes for it, after controlling for phylogeny. As expected, metabolic rate increased with body mass whereas mass-specific metabolic rate decreased with body mass. The Cook Strait Giant Weta (Deinacrida rugosa) presented the lowest mass-specific oxygen consumption while little cave weta of the Rhapidophoridae the highest.