

Abstract

Body size clines have been widely explained by the Bergmann's rule (i.e. larger individuals in colder conditions) in homeothermic vertebrates. However, there is no general consensus in poikilotherms organisms particularly in insects. Among them, bees are a highly diverse pollinators group with high economic and ecological value. Nevertheless, no comprehensive studies of species assemblages at a phylogenetically larger scale have been carried out even if they could identify the traits and the ecological conditions that generate different patterns of latitudinal size variation. Moreover, there is a huge information gap about their body size changes during last century and the mechanisms behind these shifts, although loss of functional traits can negatively impact species communities. We thus assess the body size shifts at both spatial and temporal scales. We first investigated body size variation at continental scale and at community level among 615 bee species. While we validated this rule among many families (e.g. several solitary bee families), there are some notable exceptions (e.g. bumblebees), which follow the converse Bergmann's rule, with bigger individuals at higher temperature. Then we assessed body size shifts during the last century among six bumblebee species. We studied bumblebees sampled during the last century in two geographical areas (i.e. Belgium and northern Scandinavia, above Arctic circle). We highlighted that bumblebee body size of each species increased in Belgium over the last century, while it remains stable above the Arctic Circle. Selective pressures, mechanisms and climatic conditions that generate those trends will be discussed.