

# Yes, a non-random distribution, but why do dragonflies and damselflies not follow latitudinal gradient rules?

Maya Rocha<sup>1</sup>, Freddy Palacino<sup>2</sup>, Pilar Rodríguez<sup>3</sup>, and Alex Córdoba-Aguilar<sup>4</sup>

<sup>1</sup>Universidad Nacional Autónoma de México

<sup>2</sup>Universidad El Bosque

<sup>3</sup>CONABIO

<sup>4</sup>Universidad Nacional Autonoma de Mexico

November 16, 2021

## Abstract

1. Latitudinal diversity gradient (LDG) is the increase in species richness towards the equator and is one of the most consistent patterns in biogeography, where current and historical processes contribute to shape the pattern. 2. Despite that LDG patterns have been described for some insects, the underlying mechanisms associated with community assembly and diversification along modern latitudinal diversity gradient pattern remain unknown for many groups. 3. Odonata is an old order of insects that originated during the Carboniferous and has diversified through different eras. Here, we defined co-occurrence based on the presence in ecoregions and  $1^{\circ} \times 1^{\circ}$  grid cells of Odonata species in North America NA, to address their species richness, phylogenetic structure, and species diversification rate along the latitudinal gradient. 4. For the whole order, we found the highest species richness at mid-latitudes, while phylogenetic diversity showed a linear positive pattern along the gradient. Our results showed dragonfly assemblages were clustered along all the gradient, suggesting that environmental filtering sorted the assemblages. Whereas damselfly species assemblages were clustered at mid-latitude and overdispersed into both extremes of gradient, probably community assembly is driving by thermal gradients at mid-latitude, by competitive exclusion at south extreme, and by different origins of the biota at the boreal zone. Our results show that apparently most ancestral lineages of Odonata inhabit tropical zones, where diversified and dispersed to the temperate region, although likely also have been diversified into regions of NA, which might be linked with the highest species richness at mid-latitude for both suborders.

## Hosted file

Manuscript.docx available at <https://authorea.com/users/446415/articles/545654-yes-a-non-random-distribution-but-why-do-dragonflies-and-damselflies-not-follow-latitudinal-gradient-rules>