Temperature-size responses match latitudinal-size clines in arthropods, revealing critical differences between aquatic and terrestrial species - DTU Orbit (11/12/2018)

Temperature-size responses match latitudinal-size clines in arthropods, revealing critical differences between aquatic and terrestrial species

Two major intraspecific patterns of adult size variation are plastic temperature-size (T-S) responses and latitude-size (L-S) clines. Yet, the degree to which these co-vary and share explanatory mechanisms has not been systematically evaluated. We present the largest quantitative comparison of these gradients to date, and find that their direction and magnitude co-vary among 12 arthropod orders ($r^2 = 0.72$). Body size in aquatic species generally reduces with both warming and decreasing latitude, whereas terrestrial species have much reduced and even opposite gradients. These patterns support the prediction that oxygen limitation is a major controlling factor in water, but not in air. Furthermore, voltinism explains much of the variation in T-S and L-S patterns in terrestrial but not aquatic species. While body size decreases with warming and with decreasing latitude in multivoltine terrestrial arthropods, size increases on average in univoltine species, consistent with predictions from size vs. season-length trade-offs.

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