Temporal dynamics and adaptiveness of thermal phenotypic plasticity

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Résumé

Phenotypic plasticity can allow organisms to cope with environmental changes. Although reaction norms are commonly used to quantify plasticity along gradients of environmental conditions, they often miss the temporal dynamics of phenotypic change, especially the speed at which it occurs. We argue that studying the rate of phenotypic plasticity is a crucial step to quantify and understand its adaptiveness. We illustrate this by retracing the time course of plasticity across four traits in twelve isogenic strains of the ciliate *Tetrahymena thermophila* to test how the temporal dynamics of plasticity mediate its adaptiveness under fluctuations. We showed that the shape of reaction norms changes through time depending on the rate of phenotypic plasticity, that the rate and capacity of plastic changes were positively correlated, providing empirical evidence that a high plastic capacity may often be co-selected with the ability to be implemented quickly. Furthermore, our main finding is that the temporal components of plasticity were important to explain performance in fluctuating conditions, more so than the plastic capacity alone. Iteratively measuring plastic traits allows us to describe the actual dynamics of phenotypic changes and avoid quantifying reaction norms at times that do not truly reflect the organism's capacity for plasticity. Integrating the temporal component in how we describe, quantify, and conceptualize phenotypic plasticity can change our understanding of its diversity, evolution, and consequences.

Mots-Clés: Rate of plasticity, Plasticity capacity, Environmental fluctuations, adaptive plasticity, microcosms.

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