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Editorial: Ecological and evolutionary relevance of phenotypic plasticity in a changing world

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Editorial on the Research Topic
Ecological and evolutionary relevance of phenotypic plasticity in a changing world

Understanding the ecological and evolutionary consequences of phenotypic plasticity, the ability of an individual genotype to produce different phenotypes in response to environmental variability, is crucial to consider in light of the rapid change in global environmental conditions that we are now experiencing (Kingsolver and Buckley, 2017). Whilst the evolutionary potential to respond to these novel environments is still debatable, increasing our knowledge of such a process gives us indispensable information into the mechanisms that will underpin the changes to an organism's distributional range and local extinction probability (Merilä and Hendry, 2014). This Research Topic aimed to bring together a wealth of different eco-physiological disciplines, from evolution to physiology, to better understand the mechanisms that allow organisms both at the individual and at the population level, to maximize fitness and survival in response to changing environments.

This Research Topic presented studies focusing on a variety of species' responses to novel conditions and the ability of trait expression to change across varying environmental gradients and in combination with multiple stressors. Several studies focused on the exposure of populations to predators, or to competing species, in environments that were exposed to anthropogenetic stressors and provided several key take-home messages. First, the response of organisms to predators may manifest in changes to multiple correlated traits, such as anti-predator morphology and behavior, that differ depending on the timescale studied (Mühlenhaupt et al.). Second, anthropogenetic changes, such as the influx of various pollutants into an organism's environment, can fundamentally alter predator–prey interactions (Becker and Beckerman) and plastic responses to predation pressure (Qin et al.). Therefore, highlighting the importance of considering multi-trait individual changes in response to altered species interactions *together with* the presence of stressors produced by increased anthropogenetic activity. Finally, investigating the invasion success of both native or non-native (invasive vs. non-invasive) species of both plants and, to a greater degree, animals, might be valuable in determining the overall effect of population susceptibility to extinction when entering a novel environment (Zettlemoyer et al.).

However, not only can species experience altered interactions as a result of climate change and shifting of geographic boundaries, but they can also be exposed to changes in thermal conditions and food availability. As mentioned previously, whilst populations can often exhibit behavioral traits to cope with sudden environmental changes, there may also be corresponding alterations by other mechanisms that perhaps are not as labile, such as individual physiology. This was explored in this Research Topic by examining both the physiological and life history responses of two populations of Andean lizards, where individuals were found to differ markedly in response to the changes in multiple microclimate-induced abiotic factors (here predominantly measured as temperature and humidity) that originated from either being situated on simply a north or south slope (Clavijo-Baquet et al.). Indeed, whereas this study used two contrasting environments, the last study in this Research Topic focused on the benefits of considering a non-linear reaction norm for individuals experiencing changing food availability, another probable occurrence when species shift environmental conditions, and highlighted the strength of considering a random regression approach when analyzing the evolvability of species in novel environments (Plaistow et al.).

The studies that were included in this Research Topic varied in both scope and question. This highlights, first, the broad extent of this research area and second, also demonstrates the importance of understanding species' reactions to changing environments, particularly in light of global climactic changes. We hope that readers of this Research Topic will find these interesting papers useful and motivating for further study and insight into this crucial area of research.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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