Evolutionary constraints at low-latitude range edges under climate change

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ABSTRACT: Warm edges of species distribution have been shown to be under particular threat by climate warming as range retractions are commonly observed. It is unclear why many populations cannot adapt to and long-term persist under warmer, dryer, or hot-drier conditions. Theory suggests that changes in the selection regime and genetic limitations can play an important role in setting range limits: Selection regimes may contribute if environmental gradients become too steep or are multivariate. Genetic limitations may include low genetic variation for environmental tolerances, or genetic correlations antagonistic to the direction of selection. In a greenhouse experiment, manipulating temperature and watering, we investigated how genotypic variation for growth and performance changed from no stress to univariate to combined stress, and the presence of trade-offs among stress tolerances. We raised full-sib plants of 120 families of a genetically diverse central population of *Arabidopsis lyrata* under average southern edge conditions, as well as under heat or drought as can sometimes occur, or combined heat and drought. By tracking growth, development, and allocation strategies we produced genetic variance-covariance matrices (G-matrix) within and across experimental environments. We will present results that shed light on the role of stress on evolutionary potential in multi-trait space, the presence of trade-offs in coping under multiple stressors, and their effect on adaptation at warm range limits.