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Summary of doctoral thesis: Compensating developmental rate in dragonflies and damselflies (Odonata) as a response to photoperiod along a latitudinal gradient

Climatic gradient across latitudes poses seasonal constraints on life history traits. Ectothermic organisms are especially sensitive to seasonal constraints since their development is temperature dependent. However, it has been suggested that day length or photoperiod, which changes as the season elapses and across latitudes, can be a potential environmental cue for adaptive adjustment of life history traits to environmental conditions. The aim of this thesis is to provide an important step for understanding geographic variation in life history traits and the importance of photoperiod on life history traits along different latitude populations of odonates.

Results based on my field sampling data showed that several species of temperate odonates considerably overlap in emergence dates across 10° of latitude. This happens despite the fact that these populations experience considerable variation in climatic conditions and seasonal time constraints. Results based on laboratory common-garden experiments on egg and larval development and larval growth indicate that the expression of development and growth can be driven by adaptive plastic response to different latitude photoperiods (positive correlation between growth rate and photoperiod), which helps high latitude individuals to compensate for the seasonal time constraints. However, photoperiodic responses may differ across species, populations and developmental stages. The second adaptive response I found is caused by a fixed, population-level expression of traits, where high latitude individuals show higher development and growth rate despite experiencing more stressful environment or more generations per season. However faster growth and shorter development is traded off with size at and survival until emergence. My results also show that the evolutionary potential of development and growth is low and do not differ between studied populations. This implies that the studied fitness traits probably are constrained to evolve given the environmental change.

In general, my results highlight the role of both genetic and environmental effects in shaping compensating developmental rate in seasonally time constrained populations.