Publication

A Photoreceptor Contributes to the Natural Variation of Diapause Induction in Daphnia magna

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Diapause is an adaptation that allows organisms to survive harsh environmental conditions. In species occurring over broad habitat ranges, both the timing and the intensity of diapause induction can vary across populations, revealing patterns of local adaptation. Understanding the genetic architecture of this fitness-related trait would help clarify how populations adapt to their local environments. In the cyclical parthenogenetic crustacean Daphnia magna, diapause induction is a phenotypic plastic life history trait linked to sexual reproduction, as asexual females have the ability to switch to sexual reproduction and produce resting stages, their sole strategy for surviving habitat deterioration. We have previously shown that the induction of resting stage production correlates with changes in photoperiod that indicate the imminence of habitat deterioration and have identified a Quantitative Trait Locus (QTL) responsible for some of the variation in the induction of resting stages. Here, new data allows us to anchor the QTL to a large scaffold and then, using a combination of a new mapping panel, targeted association mapping and selection analysis in natural populations, to identify candidate genes within the QTL. Our results show that variation in a rhodopsin photoreceptor gene plays a significant role in the variation observed in resting stage induction. This finding provides a mechanistic explanation for the link between diapause and day-length perception that has been suggested in diverse arthropod taxa.
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