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# Melanin-based coloration reflects sex-specific investment in reproduction in wild brown trout

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## Abstract

Melanins are the most widespread pigments in animals but their adaptive significance of remains elusive. Recent studies suggest that eumelanin-based coloration reflects individual genetic-based alternative strategies to cope with environment variability and climate changes. However, empirical evidence is still scarce. The brown trout *Salmo trutta fario* is an ideal model species to test such hypothesis, given its high intra-specific variability in skin coloration. In this study we experimentally manipulated the flow regime in artificial streams and compared the reproductive investment, immune changes and reproductive success of differently coloured brown trout during two reproductive seasons. First, darker males (but not females) had a higher energetic investment (but similar immune variations), compared to paler males, as shown by a higher body mass loss, and this body mass loss was higher in variable environments. This supports the hypothesis that melanin-based coloration reflects alternative reproductive strategies. However, this higher energetic investment of darker individuals did not translate into a higher reproductive success, especially when flow regime was variable. Indeed, darker males had a lower number of mates and offspring than paler ones in variable environments. Since an increased variability in river flow is expected in the next decades due to climate change, darker individuals could potentially be more sensitive to such effects compared to paler ones. This opens the interesting possibility that melanin-based coloration could be linked to different abilities to cope with climate changes in this species.

**Keywords:** Coloration, melanin, reproductive investment, trout, flow regime, reproductive success

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