

Fast phenotypic change in a sexually selected trait: A new mechanism

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ABSTRACT: Intra- and intersexual selection on male secondary sexual traits generally confer increased reproductive success in bearers with the most prominent traits. Strong selective harvest pressure of such trophy males can lead to a negative selection for trait size, and, over time, favour males with slow horn growth (genetics). However, this view ignores the role of plasticity in phenotypes and behaviour, and its impact on accelerating or decelerating the expression of sexually selected traits. We argue that changes in selection pressures (e.g., predation, selective harvest) may cause a cascade of behavioural responses, and a rapid change in trait size. We propose that selective removal of individuals with the most prominent traits induces behavioural changes in the surviving males, and thus in trait size (phenotypic expression). To test this idea, we used an individual-based simulation, parameterized with empirical data of male bighorn sheep, *Ovis canadensis*. Our model shows that the expression (phenotype, not genotype) of the trait under selection (horn size) can be negatively affected, if the biggest, most dominant males in the population are removed. The selective removal of prime males opens up breeding opportunities for younger, smaller males, which we predict would come at the expense of growth and maintenance. Indeed, we observed a rapid decline in average male horn length in our model. This result is further supported by empirical evidence in alpine ibex, *Capra ibex*, which we will discuss. We argue that this nongenetic mechanism is important because it describes how heritable traits can rapidly change because of behavioural plasticity, before any genetic changes might be detectable.

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