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Digest: Sexual selection and conflict in a novel environment*

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Understanding the role sexual selection plays in evolution is an intriguing challenge at any time, and especially in the face of rapid contemporary environmental change. Generally, sexual selection is thought to be stronger in males than in females (Kokko et al. 2012). This has led researchers to hypothesize that sexual selection could elevate population fitness, because deleterious mutations (that also affect females) are eliminated if low-quality males are purged (Whitlock and Agrawal 2009). Opposing this idea, however, is the fact that sexual selection can cause the interests of males and females to differ, creating conflict between the sexes.

There are two types of sexual conflict (Arnqvist and Rowe 2005). In interlocus conflict, antagonistic interactions can select for different traits in each sex, such as persistent male courtship and female mating resistance, that lower the fitness of the other sex. In intralocus conflict, selection on the same trait can differ between the sexes, such as when sexual selection favors greater trait expression in males than females (e.g., elongated tail feathers). Sexual conflict is inevitable whenever individuals compete for mates and fertilization opportunities (i.e., whenever there is sexual selection). The potentially opposing benefits of sexual selection and costs of sexual conflict for female reproductive output have implications for how populations evolve in a changed environment.

Theoreticians argue that a novel, hence stressful, environment reduces intralocus sexual conflict by shifting the optimal phenotype for both sexes so that net selection is more closely aligned for males and females (Connallon and Clark 2012). For example, in a warming environment, males that express genes that allow them to tolerate heat might outperform competitors and therefore experience greater mating success. Indirect sexual selection for heat tolerance would thereby increase the frequency of the relevant genes in the population, which could benefit females (Fig. 1).

In this issue, Martinossi-Allibert et al. (2017) used an experimental evolution approach to quantify sexual conflict in bean beetles (*Acanthoscelides obtectus*) after an environmental change. First, the researchers created replicated lineages of bean beetles that were adapted to different plant hosts: chickpeas or white beans. They then expanded on previous studies by estimating the strength of sexual selection and measuring sex-specific fitness and its additive genetic variance for both lineages when breeding on either familiar (adapted) or novel (maladapted) host beans. Intralocus sexual conflict was expected to decline when populations were maladapted. By isolating the discrete effects of sexual selection and sexual conflict, the authors hoped to better understand how each process affects rates of adaptation.

Males had higher genetic variance in fitness than females in all iterations of these experiments. In females, there was greater genetic variance in fitness on novel beans. Males showed the opposite pattern, indicating that the opportunity for selection on males was reduced in the novel environment, implying weaker sexual selection. This conclusion was bolstered by the lower ratio of male to female opportunity for sexual selection when breeding on novel beans. Unexpectedly, the intersexual genetic correlation was not more positive in the novel environment, so there was no reduction in intralocus sexual conflict.

As predicted with sexual selection, males had a greater opportunity for net selection compared to females. However, the environmental stress of a novel environment affected variation in reproductive success differently in each sex. As expected from theory, when shifted away from naturally selected trait optima, females experienced a *greater* opportunity for selection in the

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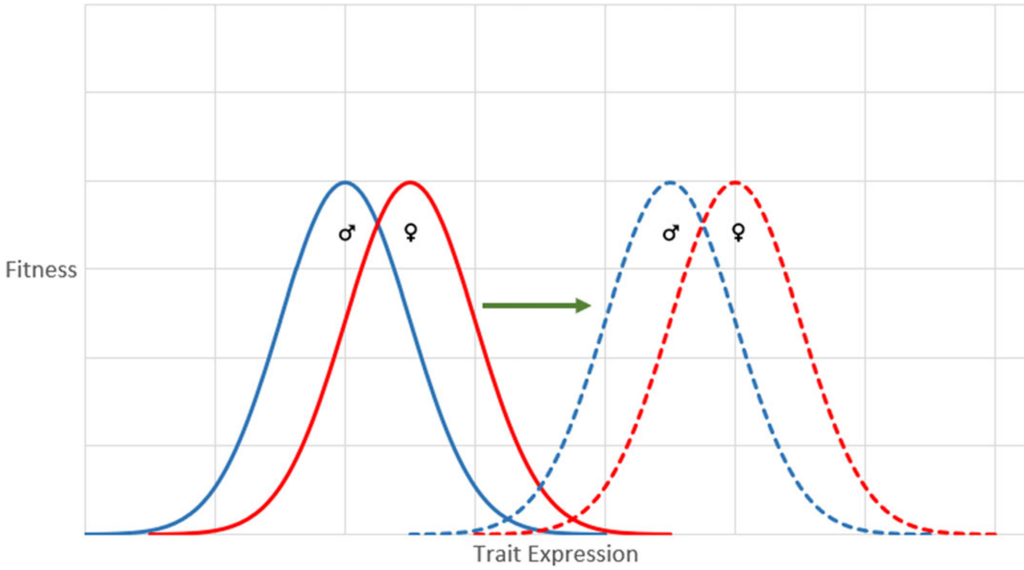

Figure 1. Effect of trait expression on fitness for each sex in two environments. Due to different male and female phenotypic optima, there is intralocus sexual conflict in the adapted environment (solid lines). The observed phenotype is likely to fall in between the male and female optima. After a significant environmental change (dotted lines), the trait optima change to higher values. One could then expect that both male and female phenotypes are now being selected for greater trait expression, reducing intralocus sexual conflict until the two sexes have moved closer to the new optima.

novel environment (Connallon and Clark 2012), but for males, opportunity for selection was significantly reduced, presumably due to weaker sexual selection. Martinossi-Allibert et al. (2017) note that male breeding success depends not only on abiotic conditions, but also the frequencies of other male genotypes (i.e., sexual competitors). They also point out that differences in female mate choice might exist between the two environments. For example, if male sexual signals change when beetles develop in the novel environment, female mate choice could be disrupted. Additionally, they suggested that the effects of sexually antagonistic selection in novel environments might be underestimated. Loci under sexually antagonistic selection have been shown to have high rates of polymorphism (Berger et al. 2016), which might assist populations in coping with environmental change.

These results highlight the complexities of interactions between intralocus sexual conflict, sexual selection, and the environment. While these findings do not complete the picture, they fill in a piece of the grander puzzle of whether or not sexual selection accelerates adaptation to novel environments.

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