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Title:	"The ties that bind": Investigating the interaction between Interlocus and Intralocus Sexual Conflict using Drosophila melanogaster
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Abstract:	Sexual conflict ensues when the evolutionary interests of males and females diverge. Conceptually, sexual conflict can be of two distinct kinds: Interlocus Sexual Conflict (IeSC) and Intralocus Sexual Conflict (IaSC). IeSC is usually defined as a conflict over the outcomes of reproductive interactions between males and females, and is thought to be mediated by traits that are sex-limited in their expression ("persistence" traits in males and "resistance" traits in females). On the other hand, IaSC is a consequence of selection acting in opposite directions in males and females on traits that are common to both the sexes. While in their first order mathematical formalisms, IaSC and IeSC are mutually exclusive phenomena, several arguments have been put forth in support of an interaction between the two. IaSC and IeSC can interact if male and female traits that mediate IeSC are genetically correlated, or have pleiotropic fitness costs when expressed in the opposite sex. Alternatively, selection gradients on traits that are shared between males and females could change (in magnitude and sign) upon changing the intensity of IeSC (and by extension sexual selection), triggering changes in the intensity of IaSC in the population. Over the course of this thesis, using an experimental technique called hemiclonal analysis, I experimentally investigated the potential ways in which IaSC and IeSC can interact in a laboratory adapted population of Drosophila melanogaster called LH. First, I sampled a panel of 39 haplotypes from the LH population, and measured the signals of IaSC (intersexual genetic correlation for fitness and proportion of sexually antagonistic fitness variation) at three different intensities of IeSC obtained by varying the adult sex ratio. My results suggested that experimentally increasing the strength of IeSC leads to a statistically non-significant reduction in the intensity of IaSC in the population. Next, I experimentally validated that changing the adult sex ratio results in a change in the intensity of IeSC and sexual selection in the population, by measuring selection gradients on a suit of sex-limited reproduction related traits at male biased, equal and female biased sex ratios. The results from these experiments also showed that the interaction between IaSC and IeSC is not mediated by intersexual correlations between resistance and persistence traits. Next, I measured the sex-specific genetic architecture of a number of sexually dimorphic traits common to both males and females (e.g., development time, dry body weight, locomotory activity and wing shape) and the nature of selection acting on these traits at different intensities of IeSC. I found evidence for female locomotory activity being associated with sexually antagonistic genetic variation at female biased sex ratio, and development time being associated with sexually concordant fitness variation at the male biased sex ratio. I also found compelling evidence of IaSC over certain aspects of wing shape at male biased sex ratio. Taken together these results suggest that the interaction between IaSC and IeSC can unfold in complicated ways. In certain scenarios strengthening one may lead to an amelioration of the other, while in certain other scenarios they may reinforce each other. Lastly, I examined a two-locus population genetic model aimed at investigating the resolution of IaSC through the evolution of sex- biased gene expression via modifier alleles. In contrast with earlier similar models, I modelled the effect of modifier alleles to be more general and showed that the resolution of IaSC may not always be guaranteed, and may depend on the exact nature of modifier alleles as well as recombination rates between modifier loci and sexually antagonistic loci. While IaSC and IeSC have been comprehensively studied in isolation, few experimental studies have attempted to investigate the two using a common experimental framework. This thesis attempts to fill this gap in our understanding of male-female evolutionary conflicts in insects such as D. melanogaster.
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