

**Sexual selection and the benefits of mating with  
attractive males in *Drosophila simulans***

Submitted by:

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I certify that all material in this thesis which is not my own work has been identified and that no material has previously been submitted and approved for the award of a degree by this or any other University.

signed: M L Taylor

A handwritten signature in black ink, appearing to read 'ML Taylor', written in a cursive style.

## **ABSTRACT**

Over the last century, sexual selection has grown from a controversial theory into a vast field of theoretical and empirical research. Although Darwin outlined two major mechanisms within his theory, male-male competition and female mate choice, the latter has promoted a wealth of research by virtue of its complexity. Despite decades of research into how female preferences and sexually selected traits have evolved, there is still little consensus as to why females prefer the males they do. Preferences are thought to evolve from either direct selection on the preference, as females themselves benefit directly from mating with a preferred male, or through indirect selection on the preference via offspring fitness. In all cases however, female preferences should compensate for the costs of discriminating between potential mates, if they are to remain overall beneficial. The fitness benefits of mating with preferred males were investigated here using the fruitfly *Drosophila simulans*, employing a range of behavioural, phenotypic and quantitative genetic approaches. The findings presented here indicate that female *Drosophila simulans* do not gain directly from mating with a preferred male. Multiple mating can increase fecundity, although costs from male harassment can reduce the net benefit. They also indicate that females may benefit indirectly from mating with attractive males as attractiveness is heritable and sons of preferred males are themselves preferred. There is also evidence that attractive males are successful in both the pre- and post-copulatory sense, as preferred males are better sperm competitors than less-preferred males. However, although there appear to be benefits from preferred males via their sons, there appear to be no benefits from males via their daughters' fitness. These findings collectively indicate that female preferences in *Drosophila simulans* are driven by indirectly selected benefits (via Fisherian sons), and that females benefit directly from mating multiply.

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## **AUTHOR'S DECLARATIONS**

### CHAPTER 1: Introduction: sexual selection and female mate choice

The views presented here represent my own survey and interpretation of the current literature, under the guidance of Dr David Hosken and Dr Nina Wedell.

### CHAPTER 2: Sexual selection and female fitness in *Drosophila simulans*

Dr David Hosken and Dr Nina Wedell provided guidance for planning and structure of all experimental procedures and preparation of the manuscript. I collected the data, conducted the analysis and am first author on the manuscript.

### CHAPTER 3: Multiple mating increases female fitness in *Drosophila simulans*

Dr David Hosken and Dr Nina Wedell provided guidance for planning and structure of all experimental procedures and preparation of the manuscript. I collaborated with Clare Wigmore to collect the data. I conducted the analysis and am first author on the manuscript.

### CHAPTER 4: The heritability of attractiveness

Dr David Hosken and Dr Nina Wedell provided guidance for planning and structure of all experimental procedures and preparation of the manuscript. I collected the data, conducted the analysis and am first author on the manuscript.

### CHAPTER 5: Attractive males have greater success in sperm competition

Dr David Hosken and Dr Nina Wedell provided guidance for planning and structure of all experimental procedures and preparation of the manuscript. I collaborated with Katherine Hoyle to collect the data, and am second author on the manuscript.

### CHAPTER 6: Attractive males do not sire superior daughters

Dr David Hosken and Dr Nina Wedell provided guidance for planning and structure of all experimental procedures and preparation of the manuscript. I collected the data, conducted the analysis and am first author on the manuscript.

### CHAPTER 7: Conclusions and prospects: sexual selection and the benefits of mating with attractive males in *Drosophila simulans*

The conclusions presented in this Chapter represent my own interpretation of the data presented in the previous chapters, under the guidance of Dr David Hosken and Dr Nina Wedell.