

Evolutionary Constraints Associated with Color and Aggression in *Drosophila melanogaster*

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Introduction

- Pleiotropy (one gene affects multiple unrelated traits) can limit adaptive evolution. This can affect our ability to predict adaptive change.
- This may be seen in the relationship between melanin-based coloration and aggression behaviors in *Drosophila melanogaster*. Differences in melanin-based coloration have been correlated with various differences in behaviors in several species (1-2).
- Dopamine is a precursor in the melanin biosynthesis pathway in *D. melanogaster*, so increased melanin utilization for coloration may result in less available free dopamine, which may cause more aggressive behaviors (3).

Hypothesis: We hypothesized that selecting for darker pigmentation would result in more aggressive behaviors while selecting for lighter pigmentation would result in less aggressive behaviors.

Methods

- Light and dark color flies were selected with aggression tests being run every five generations up to generation 15.
- ImageJ was utilized to analyze the color of the trident section of the flies' thoraxes.
- Images were made grayscale and calibrated for black and white values (0 and 255) utilizing the black and white background of the images.
- The freeform selection tool was utilized to analyze the color of the trident after color calibration. The values were recorded in a spreadsheet.

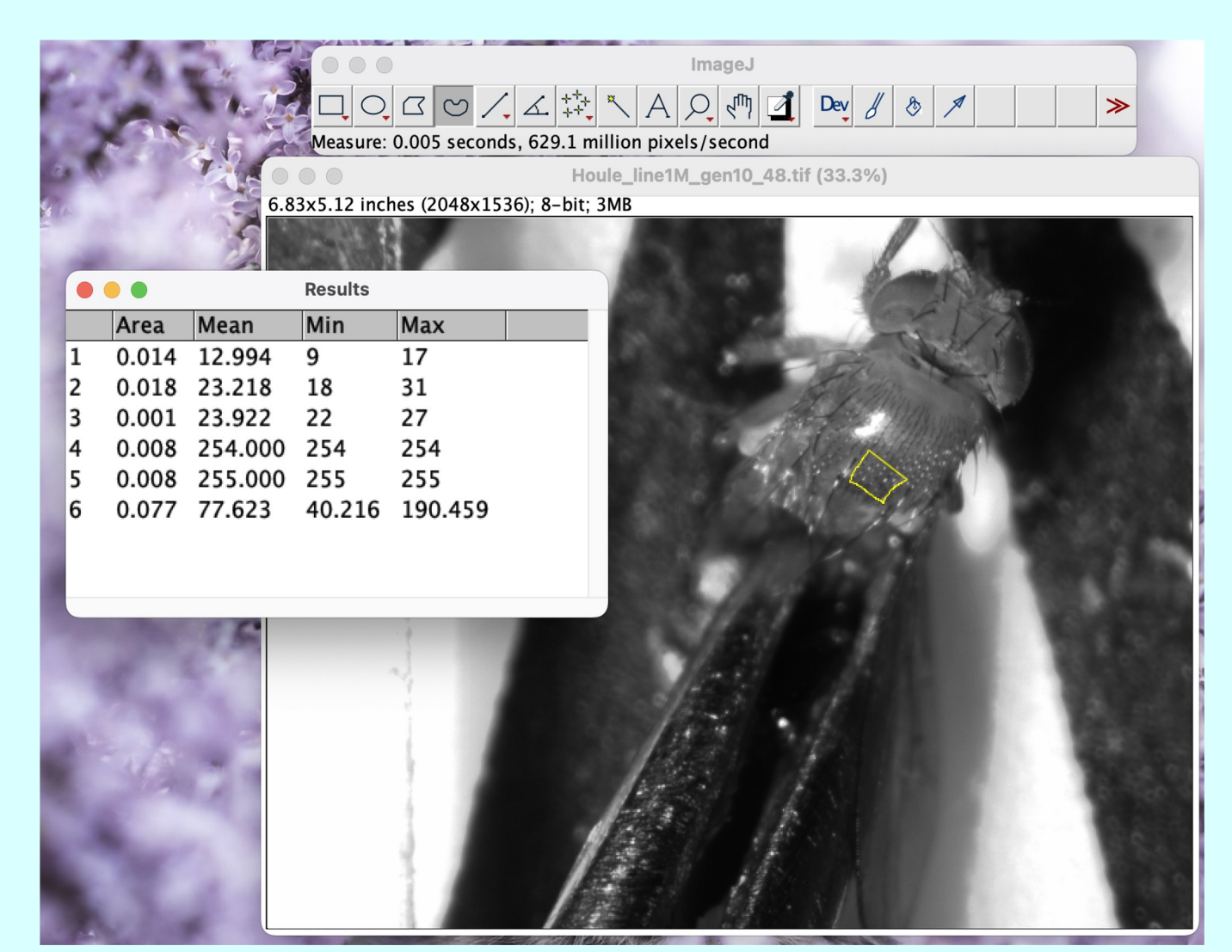
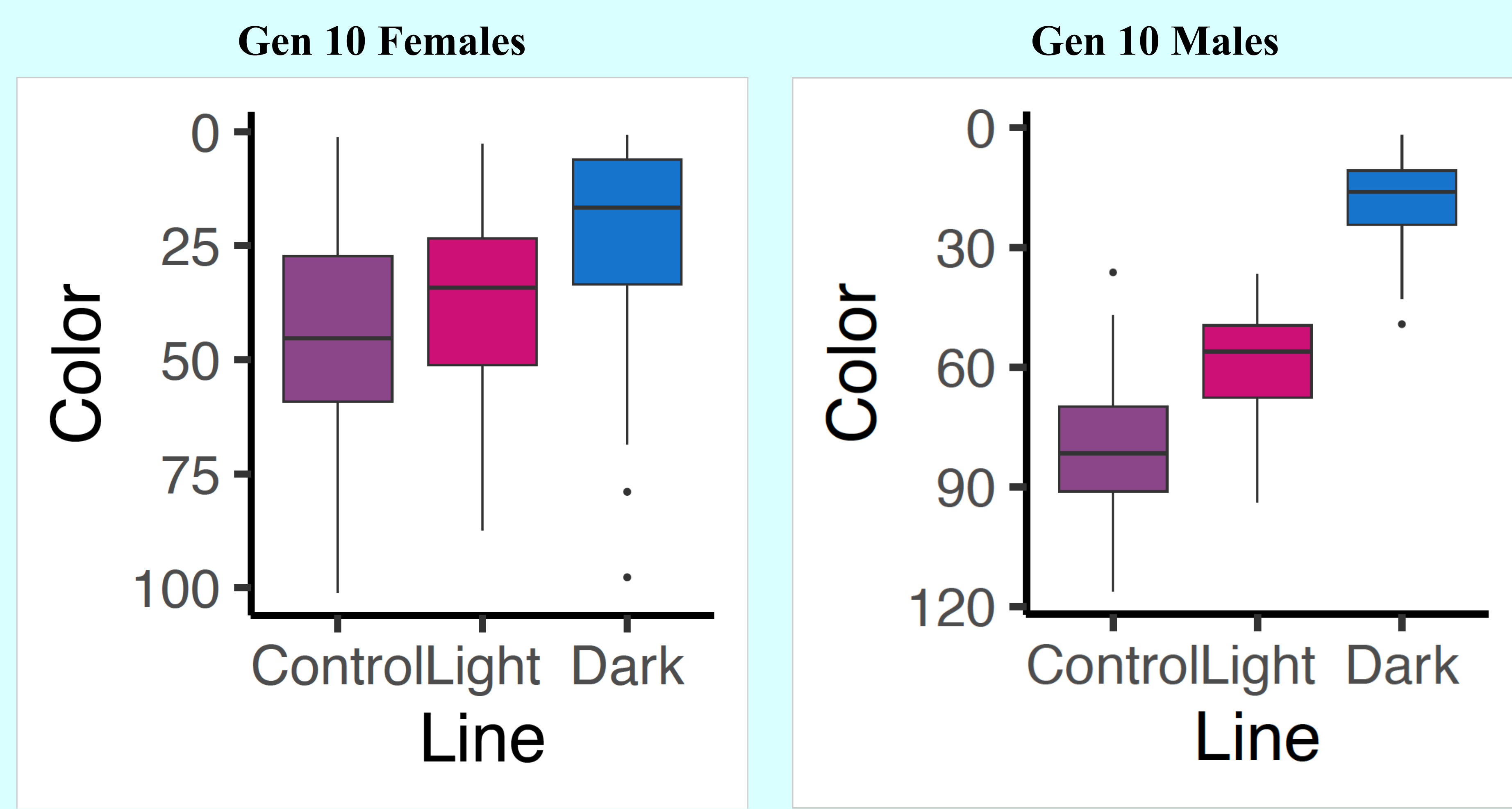


Figure 1: ImageJ software interface with black and white calibration values in the table and the trident area of the fly selected with the freeform tool.

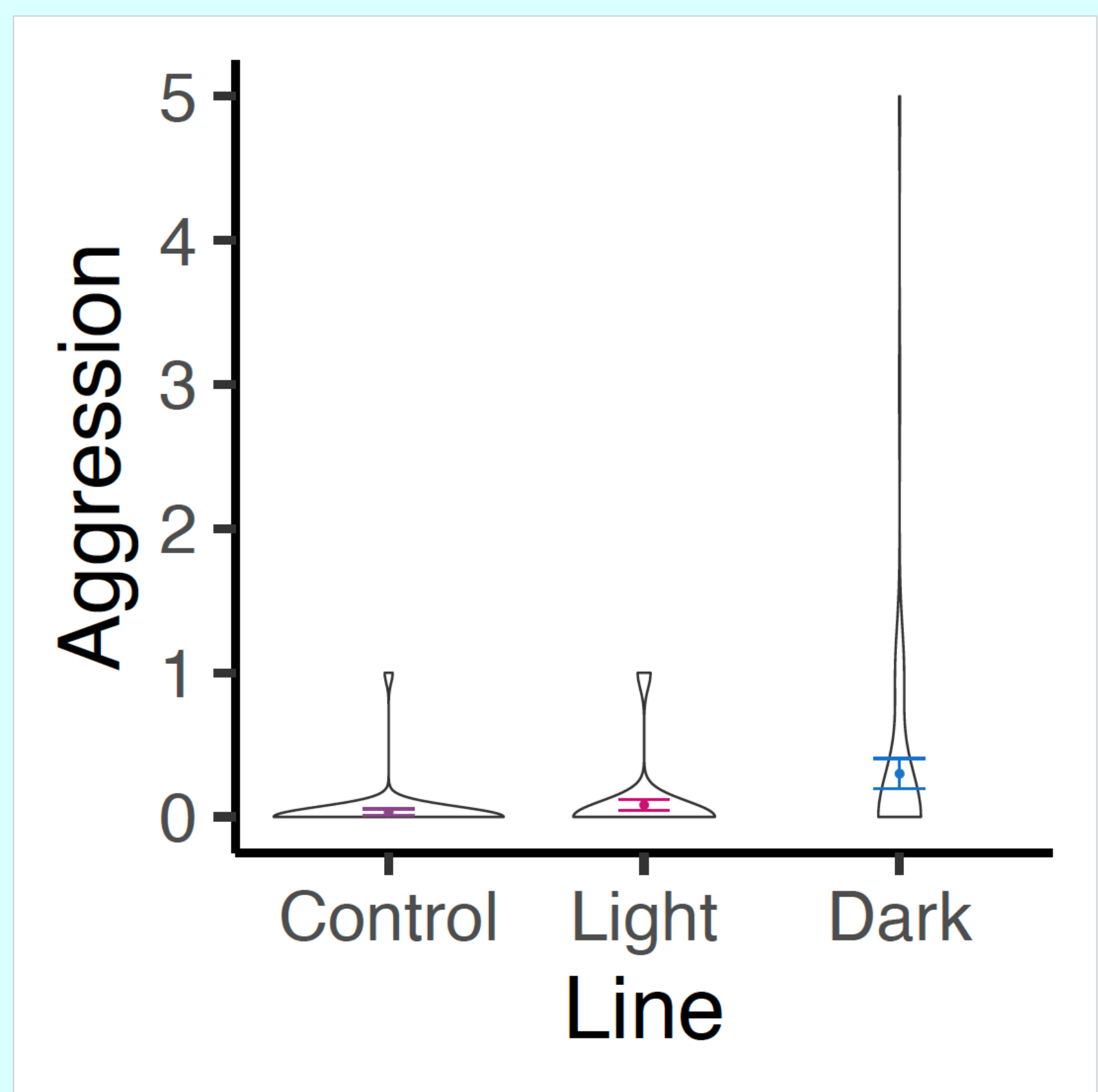
Results



	Control vs. Light	Control vs. Dark	Light vs. Dark
Females	p-value = 0.5568	p-value < 0.0001	p-value < 0.0001
Males	p-value < 0.0001	p-value < 0.0001	p-value < 0.0001

Table 1: All color data analyzed via beta regression model.

Gen 15 Males and Females



Control vs. Light	Control vs. Dark	Light vs. Dark
p-value = 0.5568	p-value < 0.0001	p-value < 0.0001

Table 2: All aggression data analyzed via hurdle model.

Conclusions and Future Directions

- Darker flies are significantly more aggressive than light selected and control flies
- This supports our hypothesis that dark *D. melanogaster* individuals are more aggressive than their lighter counterparts.
- This provides more evidence for a possible pleiotropic effect between color and aggression in *D. melanogaster*.
- The next step in this research will be to determine the exact genes which are causing this pleiotropic effect.

References

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