

# Effect of *kayak* and *center divider* on *Drosophila* sperm length

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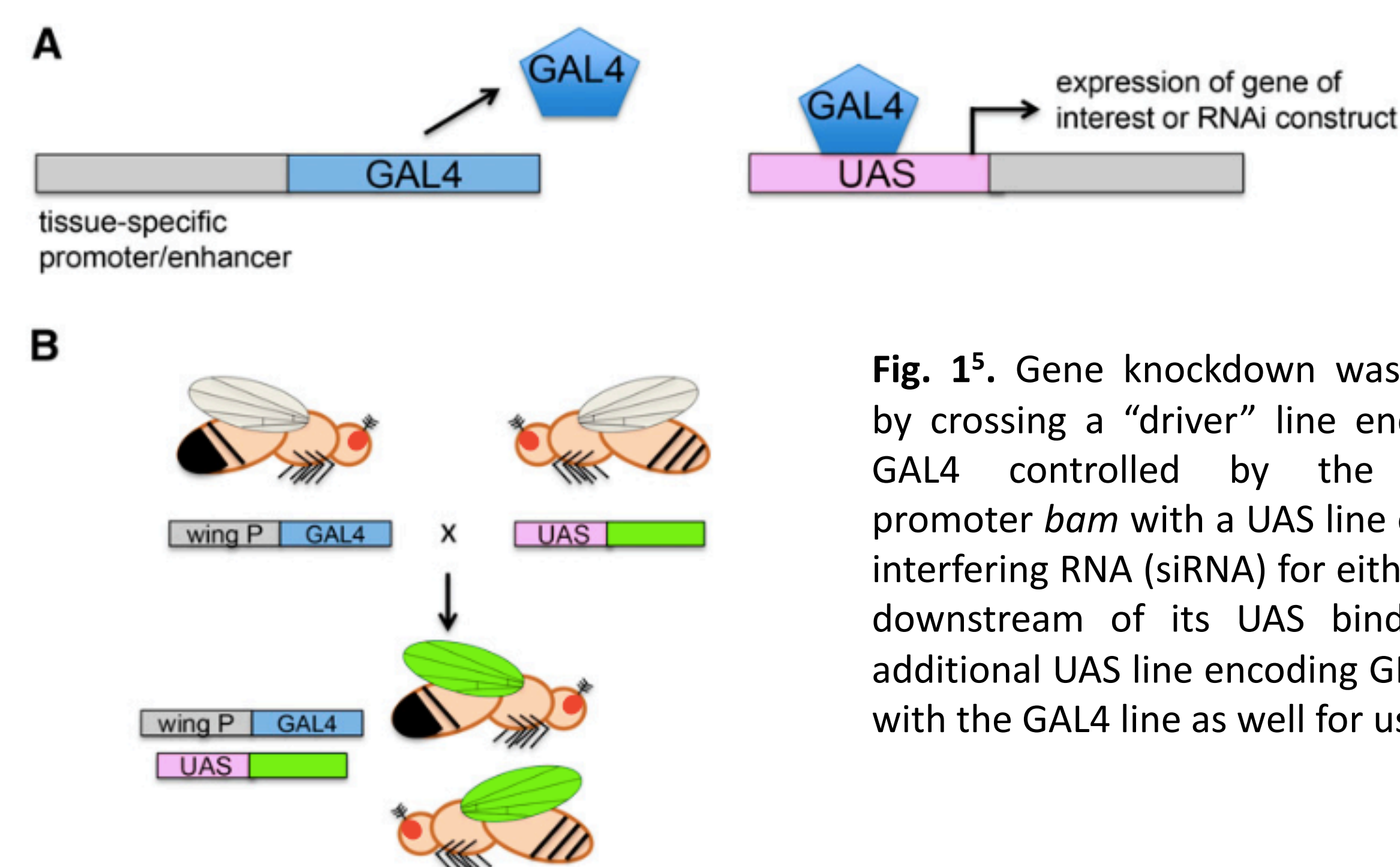


## BACKGROUND

- *Drosophila* males produce some of the longest known sperm, which may have evolved through sexual selection and male-female coevolution<sup>1</sup>
- Previous research has found that increased sperm storage organ, or seminal receptacle (SR), length in female drives the selection of longer sperm<sup>2</sup>, resulting in the coevolution of both traits
- The significant genetic correlation between sperm and SR length<sup>1</sup> suggests that these traits may be under pleiotropic control
- Knockdown of *kayak* and *center divider* (*cdi*) has been found to increase SR length, and both genes were identified through QTL mapping as candidates that may influence sperm phenotype as well

**Goal: Investigate the pleiotropic effects of *kayak* and *cdi* on male sperm and female SR length to further understand male-female *Drosophila* coevolution**

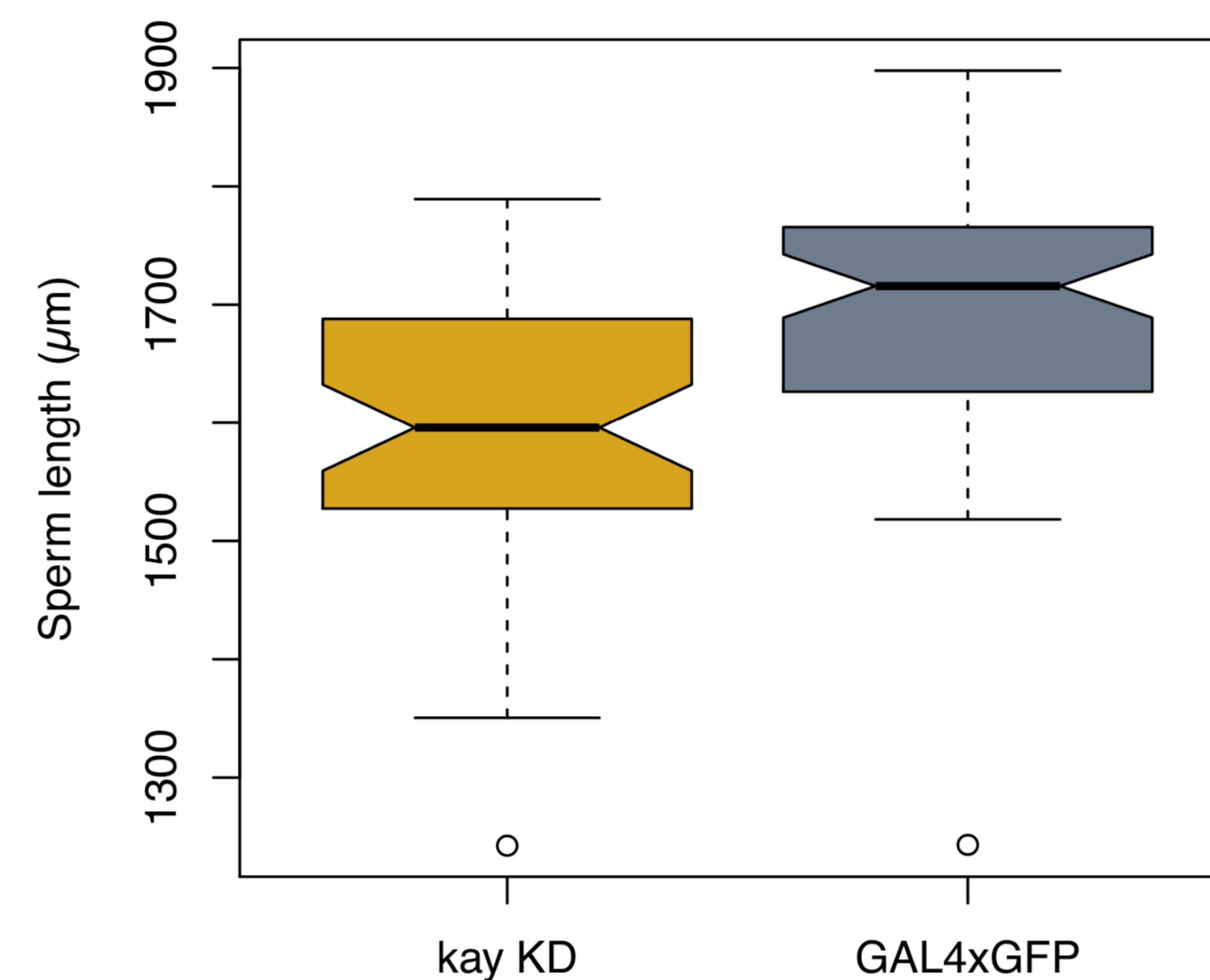
## METHODS



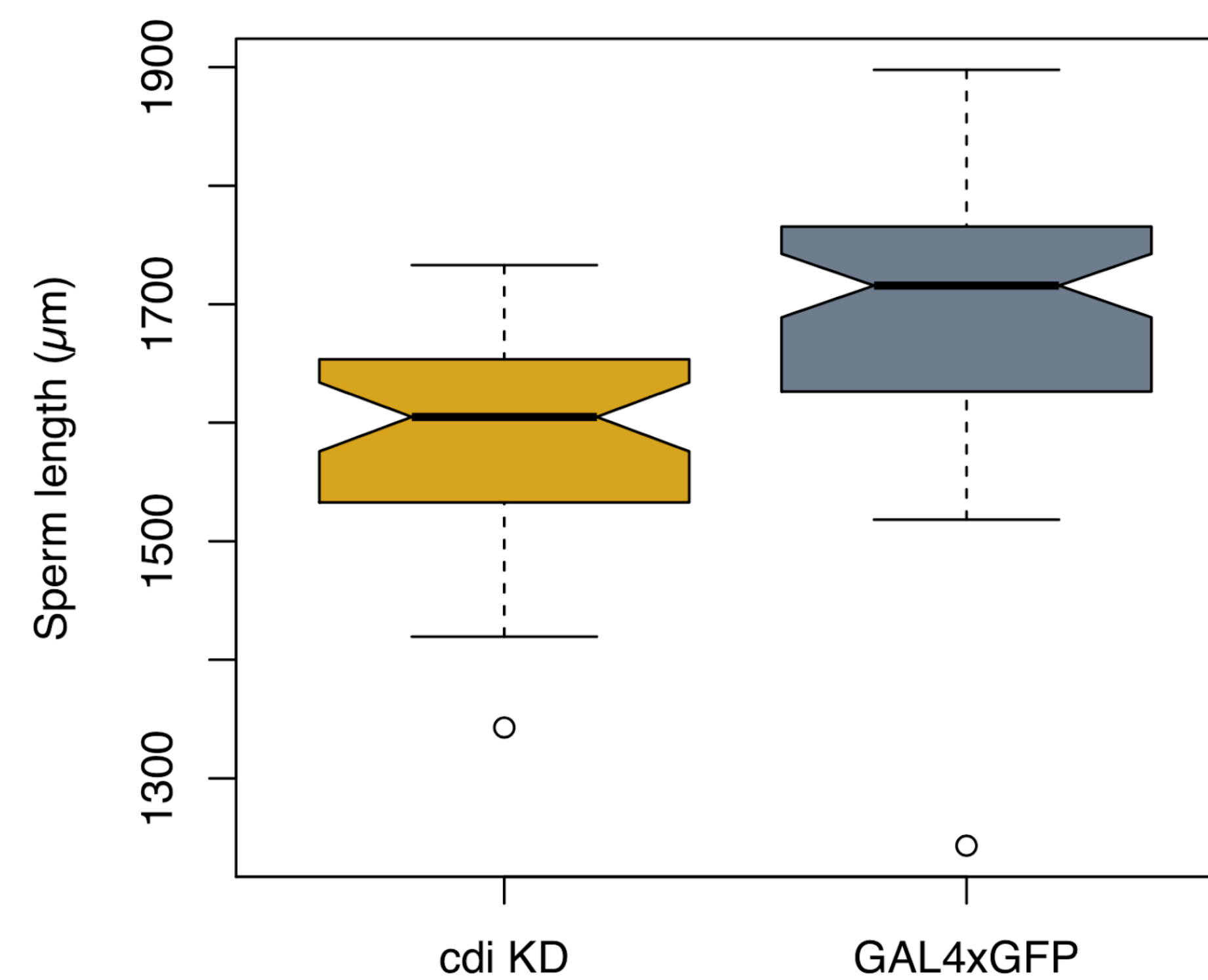
**Fig. 1<sup>5</sup>.** Gene knockdown was accomplished by crossing a “driver” line encoding protein GAL4 controlled by the testis-specific promoter *bam* with a UAS line encoding small interfering RNA (siRNA) for either *kayak* or *cdi* downstream of its UAS binding site. An additional UAS line encoding GFP was crossed with the GAL4 line as well for use as a control.

- *kayak* and *cdi* were each knocked down in experimental progeny using the GAL4-UAS system (Fig. 1)
- 30 males from knockdown as well as control crosses were dissected for sperm which was then imaged with light microscopy and measured with ImageJ software<sup>3</sup>
- Data from sperm measurements was visualized using R Statistical Software and analyzed using linear effects models<sup>4</sup>

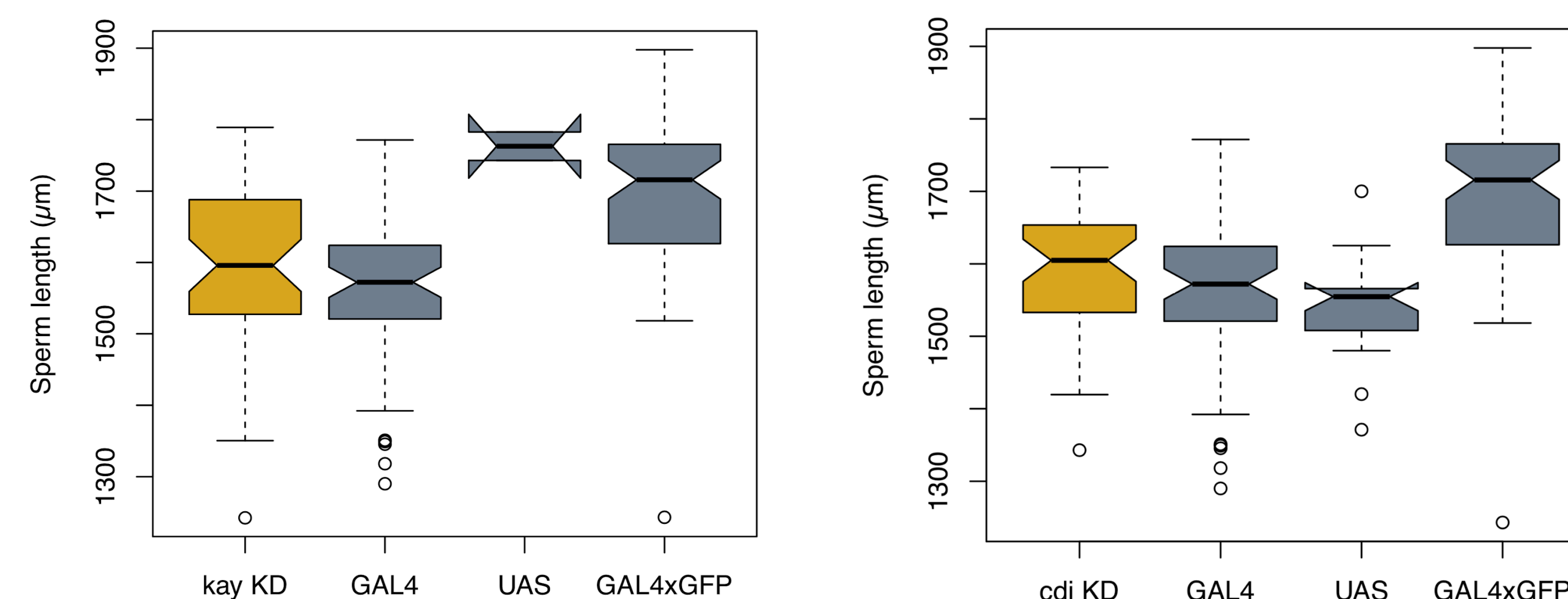
## RESULTS



**Fig. 2.** Measured sperm lengths of the experimental *kayak* knockdown and the control GAL4-GFP cross. Sperm lengths from the *kayak* knockdown cross were found to be significantly shorter than those from the GAL4-GFP cross ( $t = 2.136$ ,  $\chi^2 = 0.0326$ ).



**Fig. 3.** Measured sperm lengths of the experimental *cdi* knockdown and the control GAL4-GFP cross. Sperm lengths from the *cdi* knockdown cross were found to be significantly shorter than those from the GAL4-GFP cross ( $t = 6.845$ ,  $\chi^2 = 7.65e-12$ ).



**Figs. 4&5.** Measured sperm lengths of the *kayak* (4) and *cdi* (5) knockdowns and the control driver GAL4, siRNA UAS, and GAL4-GFP crosses. siRNA UAS and driver GAL4 control lines were disregarded in final comparisons due to their small sample sizes and inconsistent sperm lengths between replicates, respectively.

## DISCUSSION

- The results of this study provide evidence that both *kayak* and *cdi* have a pleiotropic role in sperm and SR length
- The data collected indicates that knockdown of *kayak* and *cdi* result in significantly shorter sperm length in males, which is in direct contrast to the effect of knockdown on SR length in females
- The demonstrated impact of *kayak* and *cdi* on both sperm and SR morphology indicate that the two traits are under pleiotropic control

## FUTURE DIRECTIONS

- Future studies of *kayak* and *cdi* should include a greater number of treatment replicates in order to confirm each gene’s effect on sperm morphology
- The effect of *kayak* and *cdi* knockdown on male fertility may also be investigated in order to further explore the relationship between decreased sperm length and male fitness
- Further investigation into the role of *kayak* must also take into consideration its nested *fos intronic gene* (*fig*), which is highly expressed in adult testis and may have a functional relationship with its host gene<sup>6</sup>. While the RNAi method utilized in this study was intended to knockdown the function of *kayak*, interference with *fig* remains a possibility

## ACKNOWLEDGEMENTS

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### References:

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