# Reexamination of Evolution of the Female Sperm Storage Organ in *Drosophila*

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## Background

Evolution of long sperm in *D. melanogaster* is driven by sperm competition within long seminal receptacles (SR), such that long sperm outcompete short sperm, but only in long SRs[1]. This male-female interaction means that SR length is a mechanism of cryptic female choice, and longer SRs are more selective for sperm length.

Sperm and SRs are also coevolving both across species within *Drosophila*[2] and within species[1,3], likely driven by a genetic correlation[4] and fitness benefits for both sexes[5]. Consistent with Fisherian runaway sexual selection of male traits and female preferences, **it is assumed that SR length drives evolution of sperm length, but nothing is known about what drives the evolution of SR length.**

The strength of sexual selection can be approximated using female remating rate, or the average time a female waits between her first and second mating.

Previous work examined whether sexual selection is associated with the evolution of SR length across 17 species, finding no association between remating rate and SR length. However, time to sexual maturation is correlated with SR length, opening up the possibility that long-SR species were not sexually mature when assayed for remating rate.

**Here, we included a very long SR species, *D. hydei*, and allowed at least a week before allowing females to mate, to determine if this made a difference in the relationship between SR length and remating rate.**

**Fig 1:** Male and female *D. hydei*.

## Methods

Flies were collected from a wild population in Silver Spring, MD and reared on standard sugar-yeast medium. Virgins males and females were collected three times a week and were kept in 10 mL plastic vials until the start of each experiment, when the males were 8-18 days old and the females were 7-12 days.

For each four-hour mating trial, 5 females per trial were aspirated without anesthesia into individual vials and allowed to acclimate to fresh food. One male was aspirated into a female's vial, and copulation duration was recorded. Upon copulation completion, the mated male was removed and a new one was transferred to the vial. The time to mating and time elapsed between matings was recorded.

SR length, sperm length, remating rate and average copulation duration of *D. hydei* was added to the dataset, based on previous measures from the literature and from the current experiment.

Remating rate was calculated as the average time between the first and the second matings.

## Sperm-SR Correlation

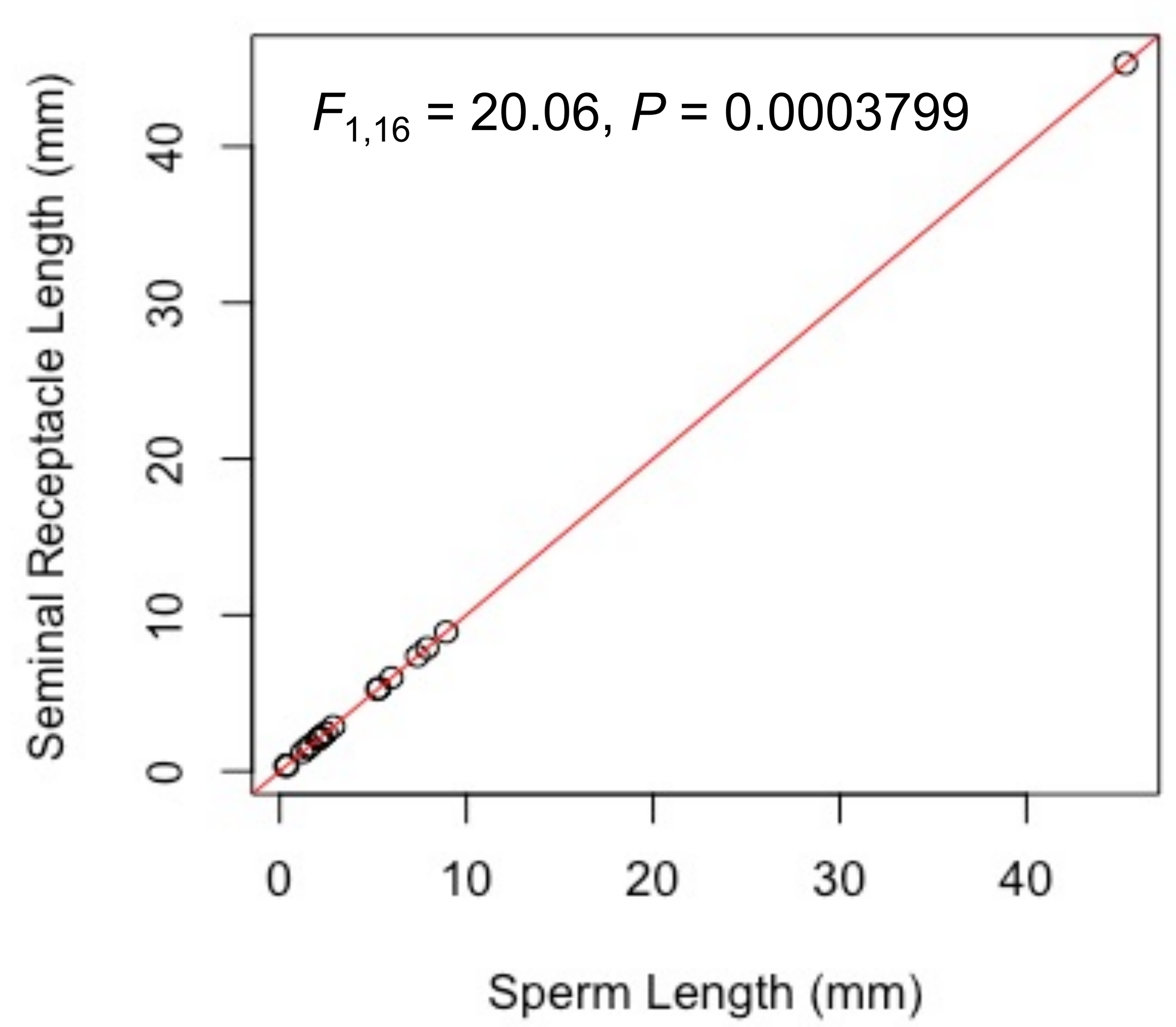


**Fig 2:** With our dataset, we confirmed a strong correlation between SR length and sperm length, first documented by [2].

## Results

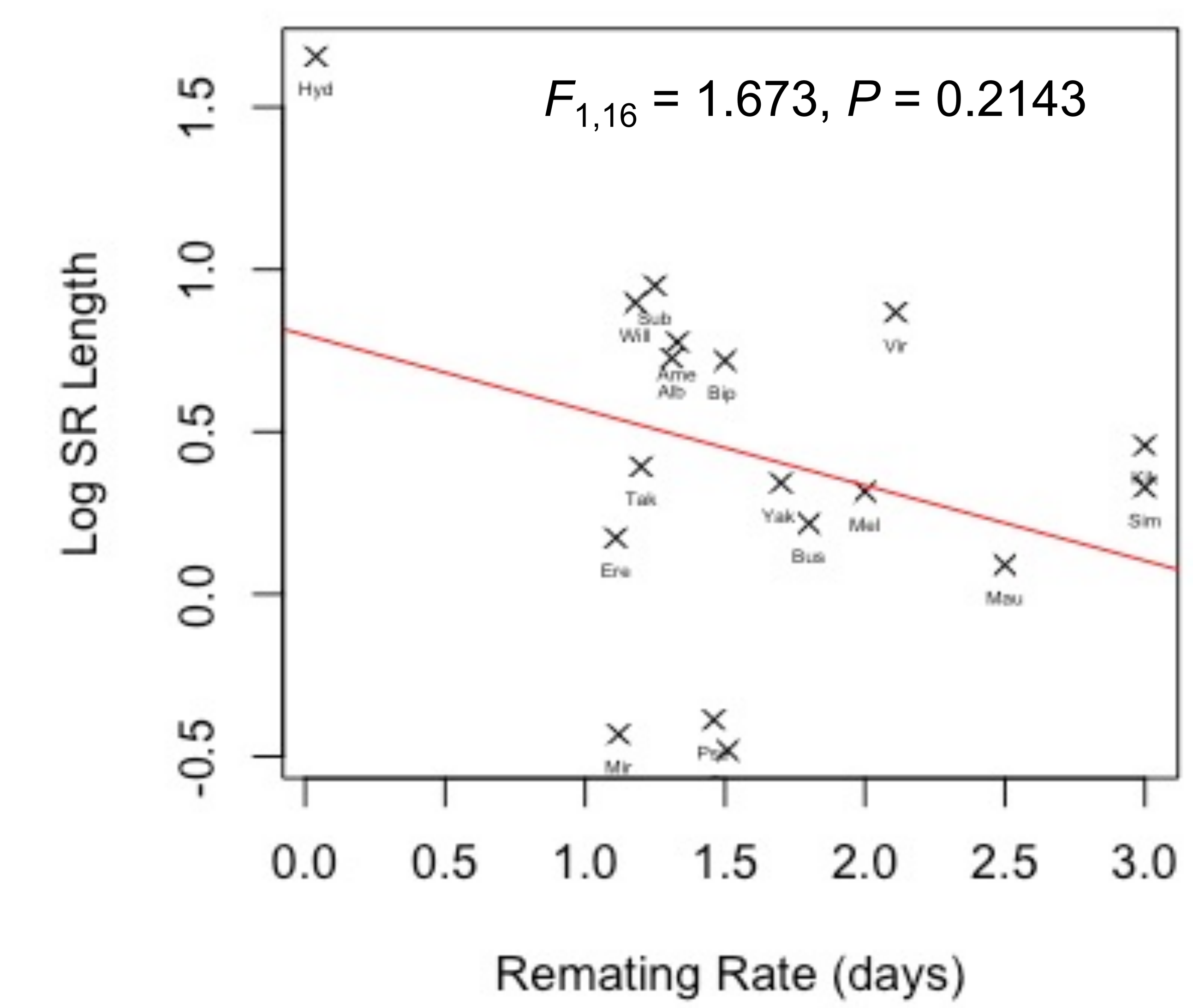


**Fig 3:** Correlation of Log SR length and remating rates (in days) of 18 species

Despite the addition of *D. hydei,* there was still no significant correlation between remating rate and SR length ($F_{1,16}$ = 1.673, P = 0.2143).

Instead, it strengthens the conclusion that sexual selection is not driving the evolution of SR length on a macroevolutionary scale.

However, there is a genetic correlation between SR length and sperm length, and long sperm and SR genotypes tend to increase fitness for both sexes. These factors may be enough to drive sperm-SR coevolution without selection specifically acting on SR length.

## Acknowledgements

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## References

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