

# Determination of Female Mate Selection in Guppies Based on Male Color Versus Length

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## Introduction

Sexual selection in female guppies (*Poecilia reticulata*) is contingent on female choice. Color and length of male guppies have been shown to be determinants for female choice (Hughes et al. 2013). We separated males into three color groups (bright, clear, and dark) and into short and long categories to test whether color or length is the major determinant for female choice in guppies.

We hypothesize that color will be more of a determining factor in female mate-choice as opposed to length. We predict that females will have a preference for clear males regardless of length.



## Methods and Procedures

- Experiment conducted at USU in Logan, Utah inside the BNR room 206 on November 5, 7, 12, and 14, 2013 at 10:30 am.
- Tank size 7.5 L, 30x14.5x20cm dimensions, with a temperature of 21.1°C. Water height 10 cm.
- Tank was split into three equal sections (10 cm) with transparent glass barriers, with the middle section separated into three equal groups for right preference, neutral, and left preference.

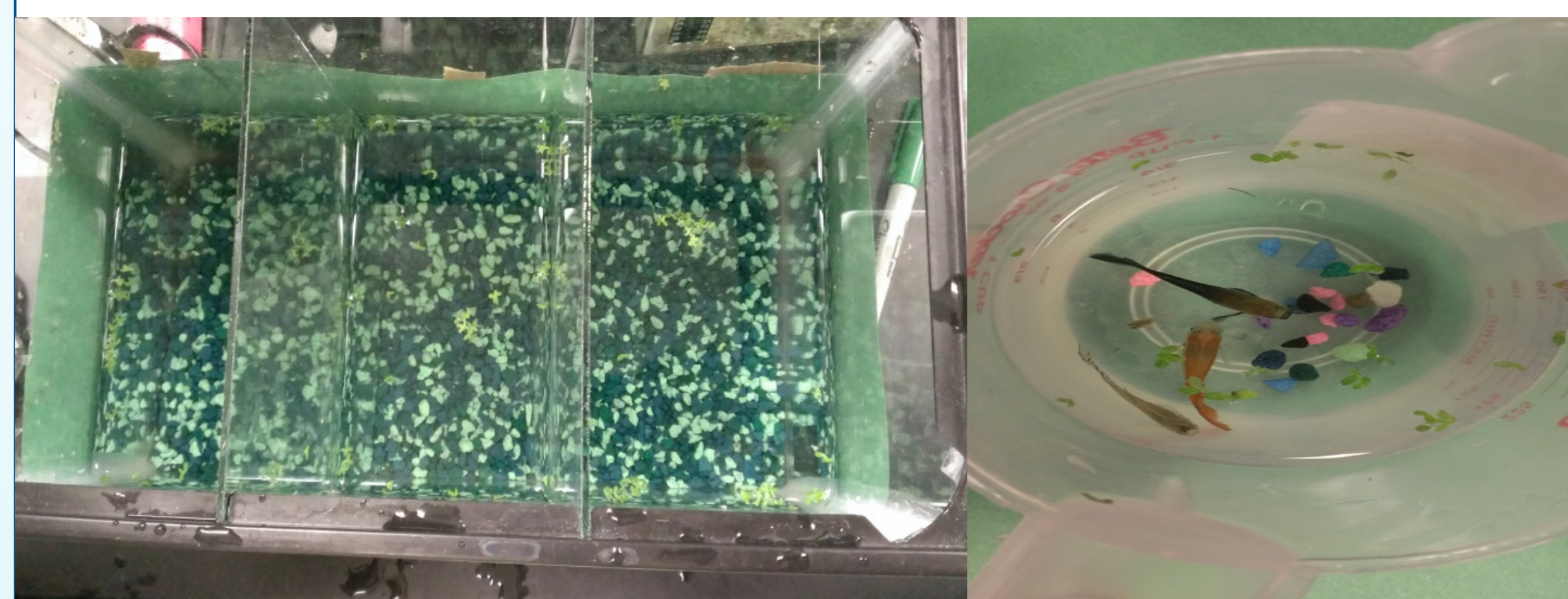


Figure 2. Test tank divisions. Figure 3. Males color classifications.

Males classified into clear, dark, or bright; long (3.5+ cm) or short (<2.5 cm) categories.

- Tested three different females with contrasting male pairs; clear vs. dark, bright vs. dark, and clear vs. bright.
- One male of each pair was placed on opposite sides of the female; female's behavior was then observed for five minutes, with the males switching sides at two minutes and thirty seconds (controlling for side bias of female).
- Total time female spent in each section was recorded, as well as the number of times that the female touched the glass with face (nose nudges).
- Identified a trend in female preference for longer males (vs. short).
- To test color vs. length, we then used the most preferred color, clear against the least preferred color, dark.
- Then tested long dark vs. short clear males for three trials; each trial consisted of three females and two males.



Figure 4. Male length classifications.



## Results

- A trend of female preference for clear males with spotted tails over bright or dark colored males was observed.

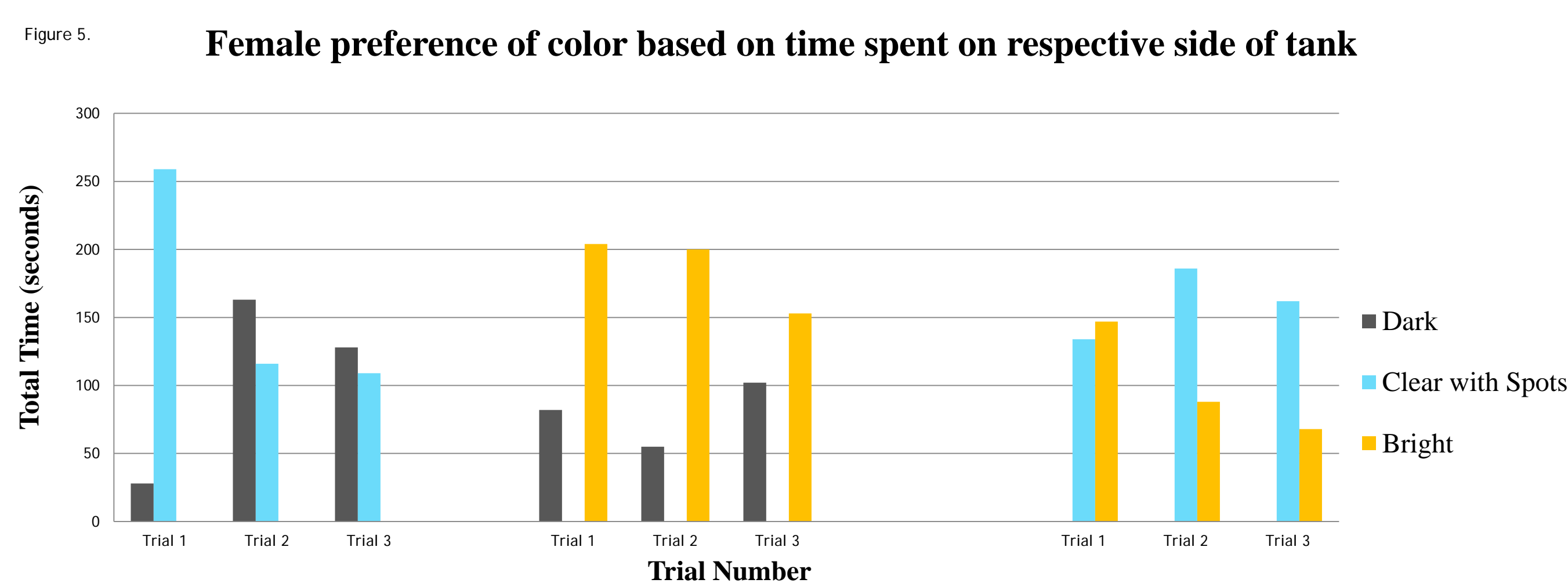


Figure 5. Total time female spent on specific colored male tank side. Three trials were run, each with three females. Dark vs. clear, dark vs. colored, and colored vs. clear males were directly tested against each other. A trend for female preference for clear males with spots was established.

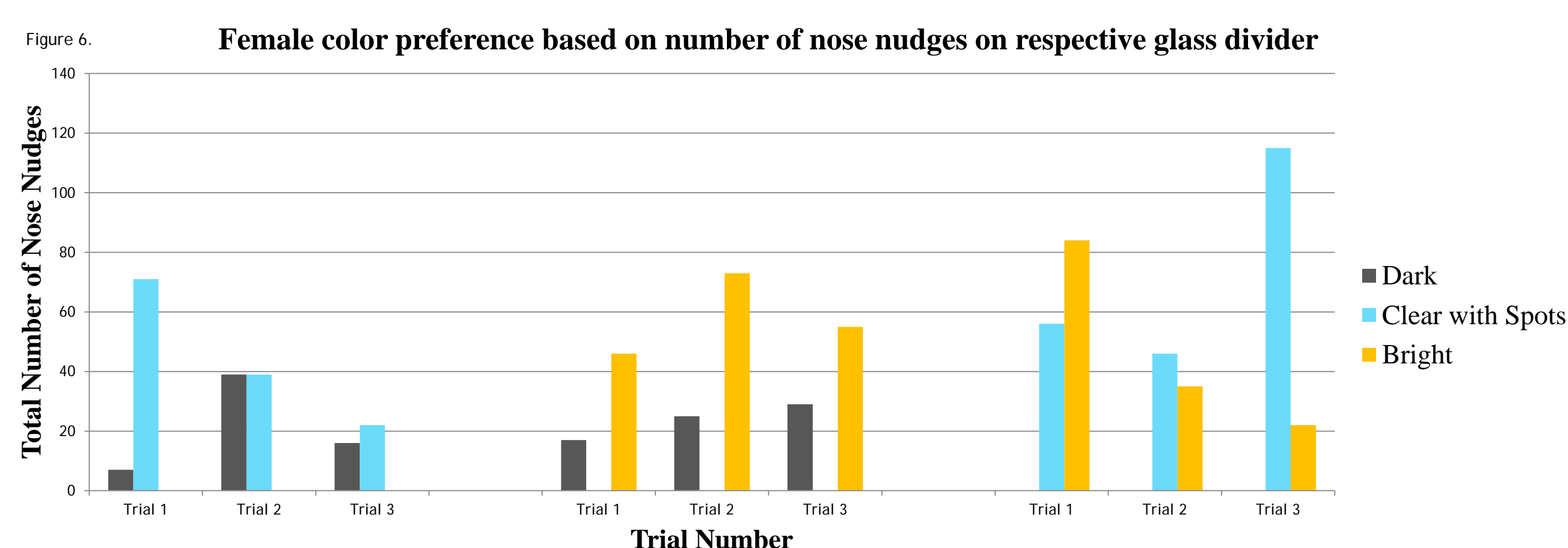


Figure 6. Total female nose nudges for specific colored male. Three trials were run, each with three females. Dark vs. clear, dark vs. colored, and colored vs. clear males were directly tested against each other. A trend for female preference was established, showing clear males with the highest total number and dark males with the lowest total number of nudges.

Figure 7.	Dark Male	Bright Male	Clear Male with Spots on Tail
Total time (sec)	558	860	966
Total number of nudges	123	315	349

Figure 7. Totals for time (in seconds) females spent on each side of the tank and for total number of nose nudges. A trend is seen with the clear males with spots having the greatest totals for female preference indicators (time and nudges) and dark males having the lowest totals for female preference indicators.

- A trend for female preference of long males (3.5+cm) over short males (<2.5cm) was observed by comparing female mate choice of a pair of males that were within the same color category but that had a size discrepancy between them.

Figure 8.		Long Dark	Short Dark	Long Clear	Short Clear
Trial 1	Seconds	83	62	148	65
	Nudges	05	02	27	09
Trial 2	Seconds	127	85	150	56
	Nudges	27	30	41	07
Trial 3	Seconds	90	162	179	55
	Nudges	09	21	73	09

Figure 8. Totals for female preference indicators of time spent on each side of the tank and number of nose nudges for long vs. short males of the same color category. This data shows a trend for female guppies preferring long males over short males of the same color. A paired t-test for the study confirmed the trend for the total time ( $P=.013$   $t=8.58$   $df=2$ ) and number of nudges ( $P=.10$   $t=2.86$   $df=2$ ) the long clear male had compared to the short clear male.

- After establishing that there were trends for female preference for both clear, spotted males, and for males that were long (3.5+cm), the color vs. length hypothesis was tested.
- These trials supported our prediction that the trend of female preference was stronger for color than for length. Overall, females preferred clear, spotted males that were short over dark males that were long.

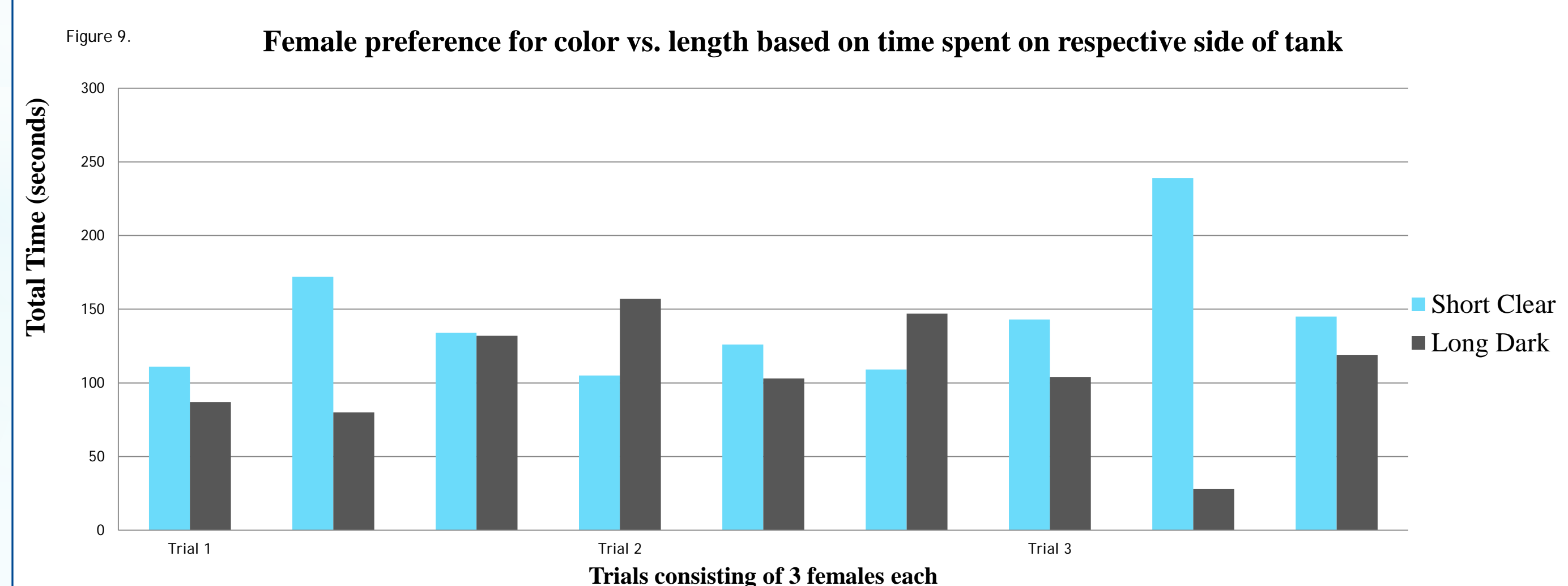


Figure 9. Totals for time (in seconds) females spent on each side of the tank. Females tended to spend more time with the short clear males than with the long dark males.

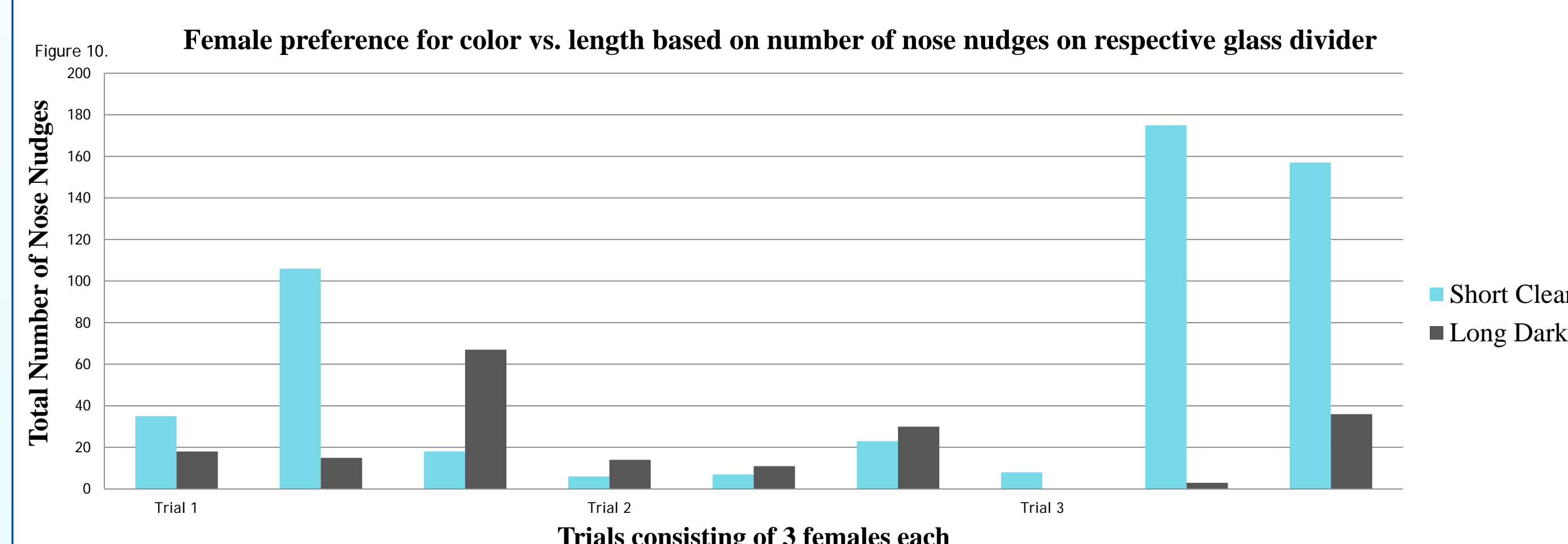


Figure 10. Total number of female nose nudges for specific males. This shows a trend in female preference with color as the major determinant of preference, seen by the short-clear male receiving higher totals than the long-dark male.

## Discussion

- Females showed the highest preference for clear males and the least preference for dark males.
- Females also showed a trend for preferring longer males over shorter males.
- When cross-tested, females showed a trend for preferring color over length (short clear males chosen over long dark males).
- Paired t-tests confirmed the trend, with the short clear males having higher means for time (mean=142.67, SD=41,  $P=0.19$ ,  $t=1.3991$ ,  $df=8$ ) and nudges (mean=59.44, SD=68,  $P=0.15$ ,  $t=1.5601$ ,  $df=8$ ) than the long dark males' means for time (mean=106.33, SD=39) and nudges (mean=21.56, SD=20).
- Further studies will need to be made to confirm that color is more of a determining factor in female mate-choice than length.



Figure 11. Test group of male guppies.



Figure 12. Female guppy.

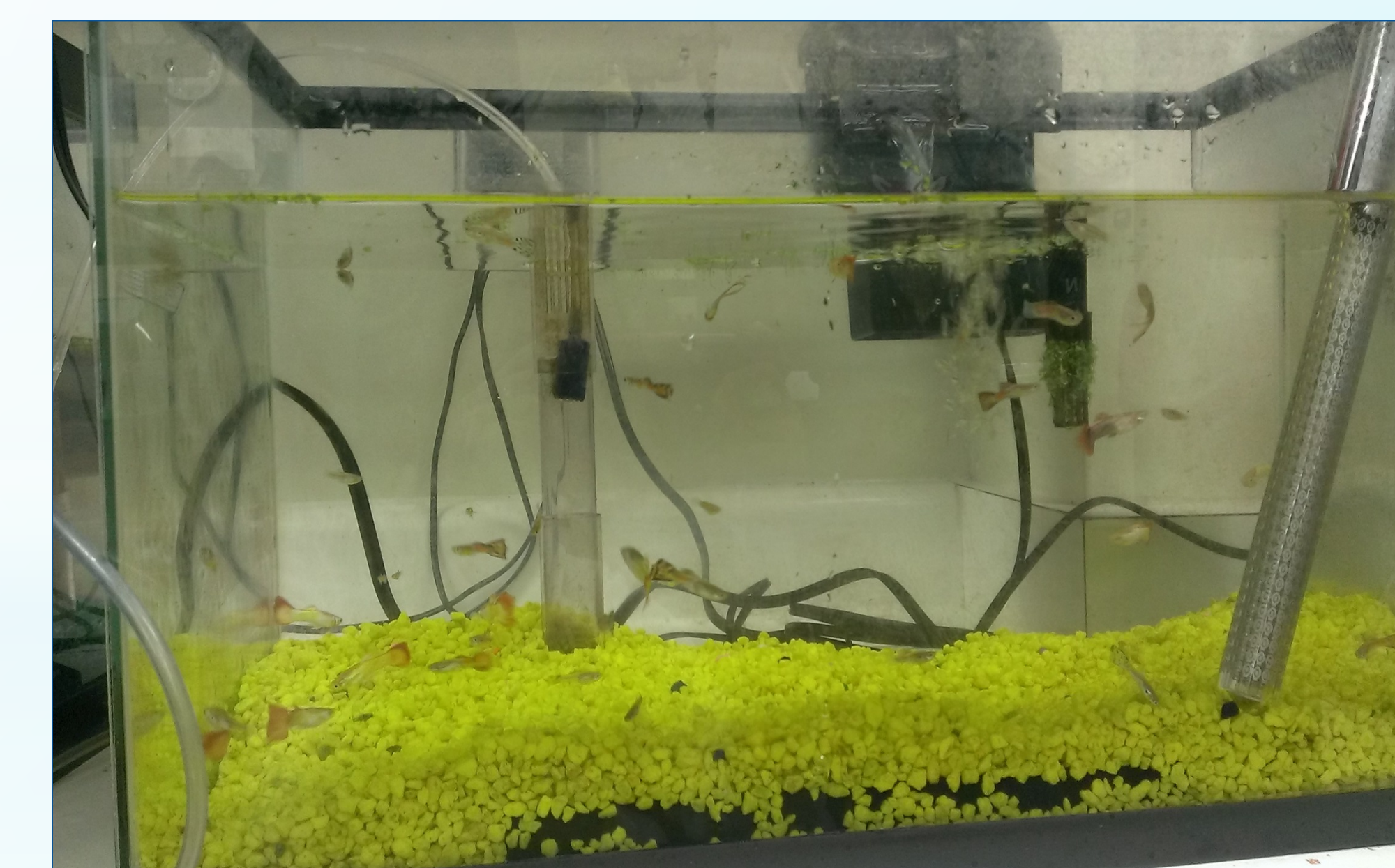


Figure 13. Male guppy holding tank.

## Acknowledgments

Hughes, K., et al. (2013). Mating Advantages for rare males in wild guppy populations. *Nature*. 503:108-110.

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