

Unrequited Love, the Bride of Frankenstein, and Fish: The Effects of Lack of Reinforcement of the Relationship Between Behavior Lateralization and Color Lateralization in Guppies, *Poecilia reticulata*

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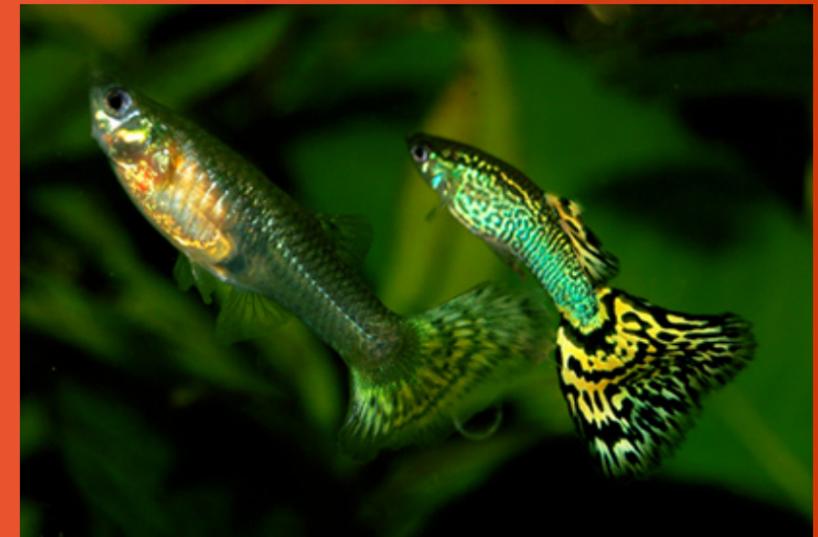
Reed College Bio342

The relationship between fluctuating asymmetry and male mating behavior is still little-studied, and new information about this relationship could have strong implications for the study of mating behavior more broadly.



http://merlinmarina.com/images/fishes/freshwater/livebearers/guppy_female1.jpg

To what extent is behavioral lateralization as a response to color lateralization in guppies ontogenetically based?



http://upload.wikimedia.org/wikipedia/commons/5/59/Guppy_coppia_gialla.jpg

Poecilia reticulata as a test organism

- Common, easily accessible
- Fluctuating Asymmetry has been proposed as an influencing factor in guppy mating behavior (Gross et al. 2007, Amcoff et al. 2009).
- Easy to handle and observe
- Variable in appearance

Materials and Methods

Treatment

Ten Guppies were kept in two tanks over the course of two weeks. One tank contained a live female, and the other contained a dummy.

Observation

After two weeks in the tank, the two remaining guppies, Rick Blaine and Victor Laszlo, were placed in observation tanks with either a live female or the dummy. They were scored for each instance of a mating display to the left or to the right. They were then photographed on both sides

Analysis

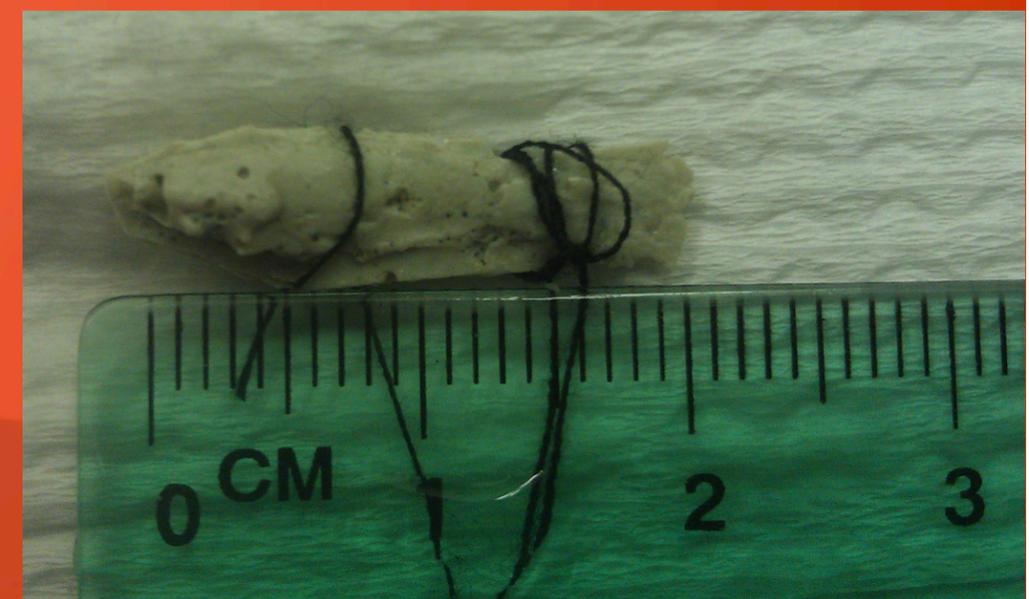
The data were analyzed using JMP and the photographs were analyzed using ImageJ. Each observation period was assigned a behavior lateralization ratio and each guppy was assigned a color lateralization ratio.



Victor, left side



Observation Apparatus



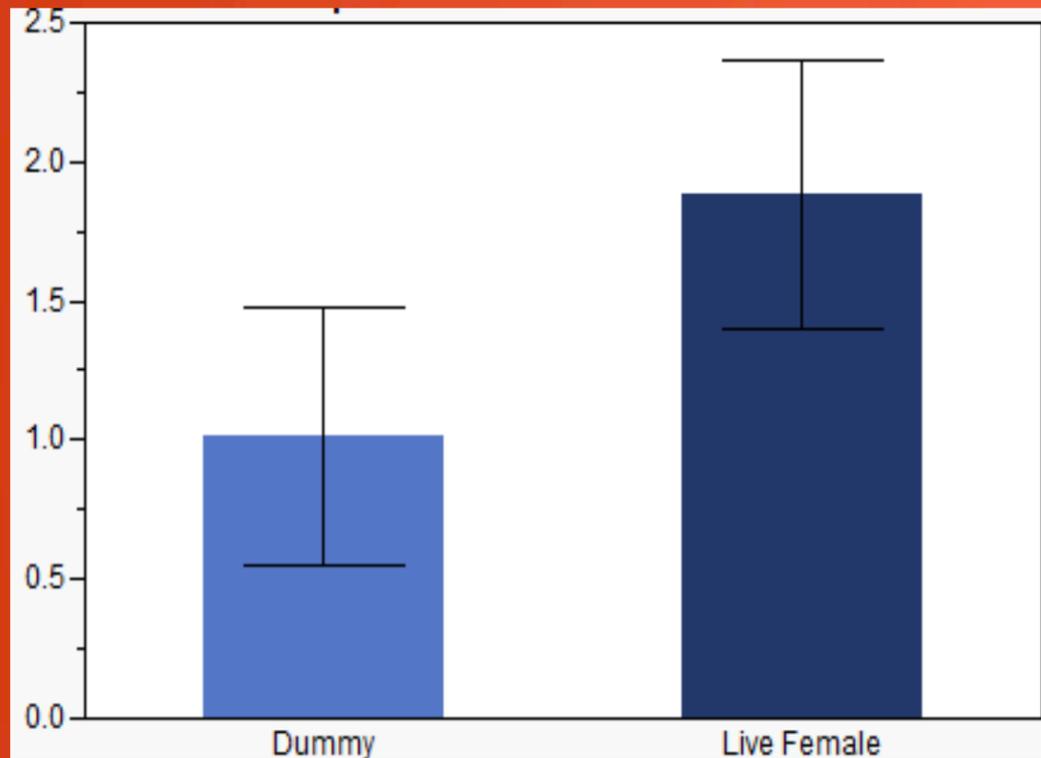
Dummy, left side

Experimental Design and Results:

In the early years of Snuffy's entrances were scored by a low-range brass musical cue

Hypothesis: If the ratio between functional asymmetry (FA) and behavioral lateralization is a learned trait, then prolonged exposure to an unresponsive female should result in a partial loss of the ratio.

Behavior Lateralization /
Color Lateralization



Behavior Lateralization = $\frac{\text{Number of Right-Side Displays}}{\text{Number of Left-Side Displays}}$
Color Lateralization = $\frac{\% \text{Orange on the Right Side}}{\% \text{Orange on the Left Side}}$

	t-ratio	Prob> t
Dummy	-3.06	0.0085*
Live Female	10.24	<0.0001*

Guppies Spent Two Weeks With

Figure 1: The mean ratios between behavior lateralization and color lateralization of the two experimental groups. Brackets represent 95% confidence intervals for the two samples. Behavior lateralization = Right-Side Displays / Left-Side Displays. Color Lateralization = %Orange on the right side / %Orange on the right side.

We Conclude that:

The question merits further study.

Caveats to the Results

1. The model female guppy didn't look all that much like a guppy, and it's possible that it did not serve its intended function as a non-responsive female guppy.
2. Most of the guppies died mid-way through the experiment, so the sample of individual guppies was very small. The small sample of guppies had an especially large effect on this study because it gave any change in behavior lateralization a much greater effect than it would have otherwise had. It would be imprudent to draw conclusions from this study without a follow-up study with a broader sample of individuals.

References:

(1) <http://en.wikipedia.org/wiki/Guppy>

(2) Gross, M. R., H. Y. Suk, et al. (2007). "Courtship and genetic quality: asymmetric males show their best side." Proceedings of the Royal Society Biological Sciences Series B **274**(1622): 2115-2122.

(3) Amcoff, M., G. Arnqvist, et al. (2009). "Courtship signalling with a labile bilateral signal: males show their best side." Behavioral Ecology and Sociobiology **63**(12): 1717-1725.

Acknowledgements:

Suzy and the Stockroom Staff, for supplying the necessary pieces and information to make the model female
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All nine of the guppies who gave their lives for science. They will be missed.