

DOES SIZE MATTER?
Female Mate Choice in *Poecilia reticulata*

Good Student
Southwest Texas State University
San Marcos, TX 78666
Organismal Biology 1431

ABSTRACT

In this experiment we examined female mate preference in the Trinidad guppy, *Poecilia reticulata*. Female guppies preferred larger over smaller males when presented with a choice between the two. When given a choice between two males of similar morphology (i.e. color distribution) but differing in length, females significantly preferred the larger male. These results indicate a size bias in female discrimination among potential mates. Demonstration of this bias indicates sexual selection may play a key role in the emergence or maintenance of certain preferred male traits in a give population.

Introduction

Intersexual selection is defined as mate choice based on behavioral and morphological traits displayed by the opposite sex. Considered as secondary sex characteristics, these traits are used primarily by the males in a given species to attract female attention. As targets of sexual selection, many of these traits have been studied extensively (Andersson, 1994).

While there is some dissension on the exact role of sexual selection, there is a general agreement that certain characteristics are preferable across species. For example several studies indicate a preference for larger size (Bischoff et al., 1985; Gabor 1999), for more colorful individuals (Houde, 1997), and for behavioral displays (Houde, 1997). Evolution or maintenance of particular male traits then could be directly influenced by sexual selection via female mate choice. Because previously *P. reticulata* females have been shown to prefer to associate with larger males (Bischoff et al., 1985) but this experiment did not control for color differences even though females prefer more colorful males (Houde, 1987). Therefore, we

decided to re-test this hypothesis of female preference for bigger males, while controlling for color differences in males.

Methods and Materials

Preference tests were conducted on three separate days (March 19, 25, and 28) between the hours of 1100 and 1400 in the common student lab room. The 45 l choice tank measured 50cm x 30cm x 28.5cm and was divided into 5 separate but equal compartments. The two end compartments were separated from the middle three by thin sheets of transparent plexi-glass dividers. The center three compartments were continuous and separated visually by externally drawn vertical lines designating left, center and right. The bottom of the tank was covered with 3 cm of small diameter gravel and was surrounded on three sides by a natural print background display.

Male pairs were chosen for size variation on length (measured from snout to tip of tail fin) with a length difference of 3mm-8mm. Males in each pair were matched as closely as possible for coloration. Females were chosen randomly from mixed sex tanks. No females were chosen from the same tanks as the males used in each trial.

For each trial, one male of each pair was placed in opposite side compartments. A random female was chosen and acclimated for 10 minutes to the center of the tank using a fine mesh isolation container. After acclimation, the female was allowed to swim freely among the middle three compartments for a period of 10 minutes. The time the female spent in each middle third of the tank was recorded in seconds with the side sections representing choice of the adjacent male and the center representing the neutral or no choice zone. As a control for side bias, each trial was conducted twice with the same pair of males appearing on opposite sides of

the tank than previously presented. A total of 15 females and 10 males were used for the duration of the trials.

Results

We found that females prefer to spend significantly more time with larger males than smaller males (Figure 1; Table 1).

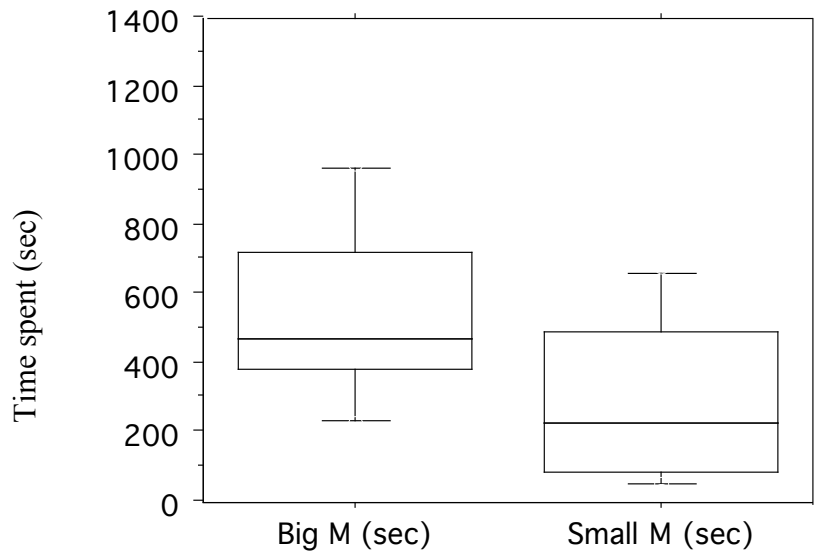


Figure 1. The amount of time (sec) female *P. reticulata* spent with big males versus small males.

Table 1 Mann Whitney U analysis of time female time spent with large males over small males in choice tests across variable male sizes.

Difference in size (mm)	N1	N2	U calc	U crit	P value
3mm	6	6	29	29	0.05
5mm	12	12	116	102	0.05
6mm	4	4	16	15	0.05
8mm	8	8	51	49	0.05

Discussion

Based on the Mann Whitney U test there was a significant female preference for larger males across all trials. Isolation of the “3mm” size difference trials produces ambiguous results. However, taken in conjunction with the other trials, the results are considered significant as the genesis of a preference trend. Therefore we were rejected our null hypothesis and supported our alternative that female guppies, *P. reticulata*, demonstrate a significant preference for larger males. These findings are consistent one study with guppies (Bischoff et al., 1985) and with previous studies of poeciliid fishes where findings reveal a size biased preference and a correlation between variation in size and strength of preference in both the male and female sexes (Marler & Ryan, 1997; Gabor, 1999; Aspbury & Basolo, 2002). Additionally, we confirmed that this preference was not changed when male color variation was controlled. These results indicate that sexual selection via female mate choice plays a role in evolving and/or maintaining morphological traits in a population.

Although expectations were met overall, several confounding issues arose during the course of our experimentation. We did not control for female receptive state differences. Uniform receptive states would have provided more solid preference data. Because of repeated use by all labs, test fish were exposed to a high degree of stress. This may have altered their natural behavior patterns. Finally, we were unable to completely isolate the test tank from outside distractions.

Mate choice and sexual selection studies are a current prevalent topic of interest to behavioral, ecological and evolutionary biologists as well as others in the field. Future areas of research should include effects of environmental stressors such as pollution, increased UV radiation and predation risks on mating preferences as well as morphological variations among

species. Comparison of mate choice versus mating success may also be beneficial in enhancing our understanding of evolutionary trends.

References

- Aspbury, A. & Basolo, A. 2002. Repeatable female preferences, mating order and mating success in the poeciliid fish, *Heterandria formosa*. *Behavioral Ecology Sociobiology* 51:238-244.
- Bischoff, J. A., Gould, J. L. & Rubenstein, D. I. 1985. Tail size and female choice in the guppy (*Poecilia reticulata*). *Behavioral Ecology Sociobiology* 17: 253-255.
- Gabor, C. 1999. Association pattern of sailfin mollies (*Poecilia latipinna*): alternative hypothesis. *Behavioral Ecology Sociobiology* 46:333-340.
- Houde, A. E. 1987. Mate choice based upon naturally occurring color-pattern variation in a guppy population. *Evolution* 41: 1-10.
- Houde, A. 1997. Sex, Color and Mate Choice in Guppies. Princeton Press, Princeton.
- Marler, C, & Ryan, M. 1997. Origin and maintenance of a female mating preference. *Evolution* 51:1244-1248.