Foraging Behavior of Male and Female Mosquitofish
(*Gambusia affinis*) in Single- and Mixed-Sex Groups

ABSTRACT

Female mosquitofish (*Gambusia affinis*) experience high levels of sexual harassment from males. We examined feeding rates among groups of solitary male mosquitofish, solitary female mosquitofish, and groups of males and females to examine how such harassment may affect feeding rates of males and females. Females feed more than males in general. Both males and females showed a reduction in strike rate when in mixed-sex groups compared to single-sex groups. Our results suggest that both male and female *G. affinis* suffer reductions in foraging when in mixed-sex groups, presumably as a consequence of the harassment of females by males.

In many poeciliid fish, males frequently harass females, through intense courtship or copulation attempts (e.g., Plath et al. 2007). Such harassment can affect the feeding of females (e.g., Magurran and Seghers 1994, Schlupp et al. 2001, Heubel and Plath, 2008, Plath 2008). Less is known about how this harassment behavior affects the feeding of males. However, Griffiths (1996) found that both male and female *Poecilia reticulata* feed more when in a group made up of only one sex, whereas their feeding is lower when in a group made up of both males and females.

In mosquitofishes (*Gambusia affinis* and *Gambusia holbrooki*), males spend much of their time and energy attempting to inseminate females, resulting in harassment of females as well as competition among males (Pilastro et al. 2003). These authors reported that in mixed gender shoals male harassment of females can result in a 50% or more reduction in foraging efficiency. This may be detrimental to females, as they require more energy than males due to their increased size as well as for egg production (Specziár 2004, Dadda et al. 2005). The costs of harassment for females can vary depending on the relative densities of male and female *G. affinis* and *G. holbrooki* (Pilastro et al. 2003, Dadda et al. 2005, Smith and Sargent 2006, Smith 2007). We are aware of no studies that examined the effects of this harassment on the feeding of male mosquitofish.

We collected male and female mosquitofish (*G. affinis*) from a pond on the Denison University Biological Reserve, Licking Co., Ohio in late March 2008. Fish were kept in 38-L glass aquaria when not being used in experimental trials. Fish were not fed 48 h prior to experimental trials to ensure they would eat during the experiment.

Experimental trials consisted of placing either single-sex (six males or six females) or mixed-sex (three males and three females) groups of mosquitofish into 0.7 L containers filled with water from the holding aquaria. Males were marked with a spot on their tail using a non-toxic blue marker to facilitate identification. Trials began when 0.026 g of chironomid larvae was placed into each container. Beginning with the first feeding strike, we counted the number of feeding strikes by each fish for two minutes. We ran nine trials per treatment.

We used an ANOVA with treatment (single-sex male, single-sex female, mixed-sex male, mixed-sex female) as the independent variable and mean strike rate as the dependent variable. We used pre-planned contrasts to make specific *a priori* comparisons of treatment means (e.g., single-sex female vs. mixed sex female, single-sex male vs. mixed-sex male, etc.). We found a significant difference in mean strike rate among the treatments (Fig. 1, $F_{3,32}=22.18, P<0.0001$). Overall, mean strike rate of females was significantly higher
than that of the males in both the single-sex groups (t = 4.99, P < 0.0001) and in the mixed-sex group (t = 2.03, P = 0.05). This result is similar to the observations of previous studies that female G. affinis and G. holbrooki forage and consume more than males (e.g., Shakuntala 1977, Blanco et al. 2004).

We found that feeding strike rate of female mosquitofish was significantly reduced by the presence of male mosquitofish (t = 5.81, P < 0.0001). Such a reduction (>50%) is in line with previous studies that have demonstrated that sexual harassment of females by males can reduce the amount of time females spend foraging and the amount of food females can consume. The ability of female G. holbrooki to forage is frequently compromised by sexual harassment by males, resulting in a 50% reduction of foraging efficiency (Pilastro et al. 2003). Female G. affinis spend more time foraging when with other females than when with males (Plath et al. 2007). Reductions of feeding in females due to sexual harassment by males could reduce the ability of females to produce offspring through a decrease in energy available for reproduction (e.g., Magurran and Seghers 1994, Ojanguren and Magurran 2007).

We also found that the feeding strike rate of male mosquitofish was reduced by about 75% when they were in mixed-sex groups compared to single-sex groups (t = 2.85, P = 0.0076). Few studies have reported the foraging rates of males in mixed-sex vs. single-sex groups in poeciliids. Thus, it appears that male mosquitofish, and possibly other poeciliids, that engage in intense courtship or attempted copulations (i.e., sexual harassment) may suffer similar reductions in foraging and feeding as do females.

![Figure 1](image-url)

**Figure 1.** Effect of group composition (single-sex vs. mixed-sex) on mean strike rate (strikes per individual per minute) of male and female mosquitofish (G. affinis). Means are given ± 1 SE.

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**LITERATURE CITED**


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