Male guppies (Poecilia reticulata) adjust their mate choice behaviour to the presence of an audience

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Summary
In recent years analyzing animal behaviour in light of the social environment has become widely accepted. Especially many mating interactions do not happen in privacy, but in a public arena, raising the question of how this affects the behaviour of both the focal individual and the observing audience individual. We studied in feral guppies whether male preferences for female body size, a correlate of fecundity, are influenced by the presence of another male, the audience. We also studied whether the audience was influenced by the observed interactions. These two aspects are not normally studied together. Furthermore, we were also interested in the question of how long changes in the behaviour of the audience male might last. We found that male preferences measured as nipping/approaches decreased in the presence of an audience. Furthermore, the audience males showed no preference for larger females when tested right after the interaction with the focal male, but returned to the typical preference for larger females after 24 h. Our study highlights the relevance of the social conditions under which mating decisions are being made.

Keywords: mate preference, communication networks, sperm competition, mate competition, mate choice copying.

Introduction
An increasing body of literature considers the question of how environmental constraints (like resource availability, presence of predators, or other ecological factors) determine the strength of sexual selection by affecting the...
expression of mating preferences (Johnson & Basolo, 2003; Cotton et al., 2006; Fisher & Rosenthal, 2006a; Kim et al., 2009). On the other hand, mate choice is obviously influenced by the social environment of the signaling and choosing individual (non-independent mate choice: Pruett-Jones, 1992; Westneat et al., 2000; Johnstone, 2001; White, 2004; Earley & Dugatkin, 2005; Bonnie & Earley, 2007; Druen & Dugatkin, 2011). Animals can observe social interactions and make use of the extracted information (Oliveira et al., 1998, 2001; Doutrelant et al., 2001; McGregor et al., 2001; Brown & Laland, 2003; Bonnie & Earley, 2007), such as in assessing the physical strength of prospective opponents (Earley & Dugatkin, 2002, 2005; Earley et al., 2005). Individuals can also use this public information during mate choice to assess the quality of potential mates (Dugatkin, 1992; Nordell & Valone, 1998; Otter et al., 1999; Doutrelant & McGregor, 2000; Mennill et al., 2003; Ophir & Galef, 2003). For example, females can eavesdrop on male contests and prefer winners to losers (Bisazza et al., 1989a; Aquiloni et al., 2008; but see Qvarnström & Forsgren, 1998), or they may copy the mate choice of other females (Dugatkin, 1992; Dugatkin & Godin, 1992; Galef & White, 1998; Nordell & Valone, 1998; Godin et al., 2005).

Audience effects occur when the presence of an observing (or by-standing) individual leads to changes in the behaviour of the observed individual(s) (Marler et al., 1986; Matos & McGregor, 2002; Matos et al., 2003; Vignal et al., 2004; Dzieweczynski et al., 2005, 2006; Plath & Schlupp, 2008; Townsend & Zuberbühler, 2009). Recent studies using a live-bearing fish (Poecilia mexicana, Poeciliidae) found males to show weaker expression of mating preferences (i.e., to interact more evenly with two stimulus females) when an audience male was present (Plath et al., 2008a,b, 2009; Ziege et al., 2009). It was argued that this effect is most likely driven by the need for males to conceal their mate choice from eavesdropping rivals (Ziege et al., 2009; see discussion), which could copy their mate choice and mate with the same female later (Schlupp & Ryan, 1997; Witte & Ryan, 2002). Ultimately, this behavioural adjustment, thus, seems to represent a response to sperm competition risk (as suggested by Plath & Schlupp (2008) and Ziege et al. (2009)). Indeed, sperm competition is intense in most poeciliid fishes examined so far (e.g., Evans et al., 2003a,b; Aspbury 2007; Wong & McCarthy, 2009; Evans & Pilastro, 2011), including the Trinidadian guppy (Poecilia reticulata; Pilastro et al., 2002; Dosen & Montgomerie, 2004; Evans & Pilastro, 2011).