

Geographic variation in female mate-copying in the species complex of a unisexual fish, *Poecilia formosa*

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Summary

The Amazon molly, *Poecilia formosa*, is a gynogenetic, all-female fish. Its mating system relies on heterospecific matings with males of closely related sexual species. In mixed populations, males mate with conspecific sexual females and heterospecific asexual females. Such matings are not isolated dyadic interactions but rather elements of a communication network, because multiple females can observe these interactions. This is the only known case of heterospecific mate-copying and, thus, a system in which the potential for mate-copying could be influenced by the presence of another species. Here we show that mate-copying is exhibited by the sexual species *P. mexicana* and *P. latipinna*, and the asexual *P. formosa*. Both sexual and asexual females copy each other's mate choice decisions in sympatry, but females from allopatric populations do not show heterospecific mate-copying. Males benefit from heterospecific matings with Amazon mollies because these increase their attractiveness to the conspecific sexual females. In mixed shoals, mate-copying potentially imposes costs as it increases a male's attractiveness to heterospecific females. We argue that the net-effect of mate-copying is beneficial to males because the relative strength of mate-copying is lower in Amazon mollies. We hypothesize that an added benefit to males lies in the signal value of copulations.

Keywords: sexual-asexual coexistence, association preferences, visual communication, video playback, evolution of mate-copying, female choice, male mating behaviour.

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Introduction

Mate choice is often influenced by the social environment. Mate-copying is one example of socially influenced mate choice in which individuals copy the mate choice of others (Losey et al., 1986; Brooks, 1998; Westneat et al., 2000; Witte, 2006). Studies on mate-copying place mate choice in a social context rather than viewing it as isolated events (Emlen & Oring, 1977; Gibson & Höglund, 1992; Pruett-Jones, 1992; Andersson, 1994; Höglund & Alatalo, 1995; Dugatkin, 1996; Galef & White, 2000; Ophir & Galef, 2004). Mate-copying is especially prevalent in fishes, where females copy conspecific females (Dugatkin & Godin, 1992; Briggs et al., 1996; Witte & Ryan, 1998, 2002), males copy males (Schlupp & Ryan, 1997; Widemo, 2006), and sneaker-males copy females (Gonçalves et al., 2003).

Although mate-copying typically occurs among conspecifics, there is a system in which it mediates heterospecific matings in the complex of unisexual mollies (*Poecilia formosa*) and their sexual counterparts. In nature, the gynogenetic *P. formosa* must obtain sperm from one of their close relatives, either *P. latipinna* or *P. mexicana*. Schlupp et al. (1994) showed that heterospecific mate-copying may contribute to the maintenance of this system because male *P. latipinna* increase their attractiveness to conspecific females by mating with the gynogenetic female *P. formosa*. Male behaviour in general seems to play an important role in this mating system (Schlupp, 2005; Riesch et al., 2008, Kokko et al., 2008).

Amazon mollies, *P. formosa*, are all-female gynogenetic fish of the live-bearing family Poeciliidae (Hubbs & Hubbs, 1932). Gynogenesis is a special form of parthenogenesis in which sperm of a host species serve as a physiological stimulus to trigger embryogenesis. The sperm normally is not incorporated into the genome of the offspring (Schlupp et al., 1998; Schlupp, 2005). In the case of *P. formosa*, sperm is usually provided by males of one of two species, *P. mexicana* or *P. latipinna* (Hubbs & Hubbs, 1932; Schlupp et al., 1998). The Amazon molly is probably derived from a single hybridisation event of a *P. mexicana* female and a *P. latipinna*-like male (Turner, 1982; Avise et al., 1991; Schartl et al., 1995). Amazon mollies range from southeast Texas to northeast Mexico. *P. formosa* is sympatric with *P. latipinna* in Texas and a few areas in northeast Mexico, while it is sympatric with *P. mexicana* in Mexico (Darnell & Abramoff, 1968; Schlupp et al., 2002).