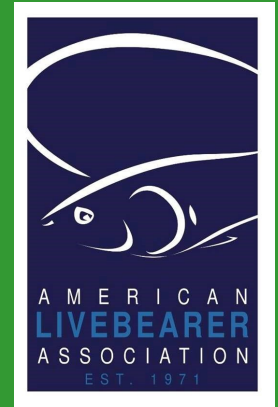


# LIVEBEARERS

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# JUST ASK A SCIENTIST!

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**QUESTION:** *Some of my wild-caught platy males have a gravid spot along with their gonopodium, could I have hermaphrodite fish?*

**ANSWER:** The short answer is: it is possible, but probably not. It is true that there are many fish species that are hermaphroditic (i.e., an individual has both male and female genitalia and can accordingly produce functional sperm and eggs). Most hermaphroditic fishes are sequential hermaphrodites; they are born female and turn into males later in life, or vice versa. Only one species – the Mangrove killifish (*Kryptolebias marmoratus*) – is a simultaneous hermaphrodite and able to self-fertilize.

There is some evidence that livebearers can be sequential hermaphrodites. Specifically, female swordtails (*Xiphophorus hellerii*) from domesticated strains have been shown to turn into functional males. In addition, there is evidence for masculinization of female livebearers in natural populations exposed to environmental pollution, but while such females exhibit some male-specific traits (like an anal fin reminiscent of a gonopodium), they do not typically produce functional sperm. I am not aware of any studies that have documented true hermaphroditism in natural populations of poeciliids, and so, I do not think that the presence of a gravid spot and a gonopodium in your fish are indicative of hermaphroditism.

Considering all of that, what is going on with those platies that have a gravid spot and a gonopodium? First, let's unpack what a gravid spot is and does. Gravid spots (also known as pregnancy spots or anal spots) are a heavily pigmented, dark region around the gonopore and anus, typically observed in female poeciliids. The exact functions of these spots are not quite clear and might vary among species. In some livebearers (e.g., some *Gambusia* and *Poecilia*), the size of spots cycles with pregnancy (hence the name). The commonly held belief is

## Example of female anal spots



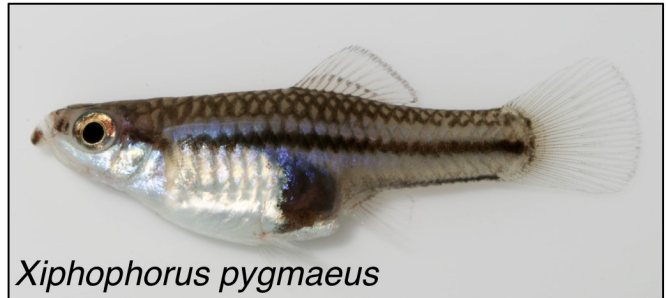
*Poecilia reticulata*



*Limia melanogaster*

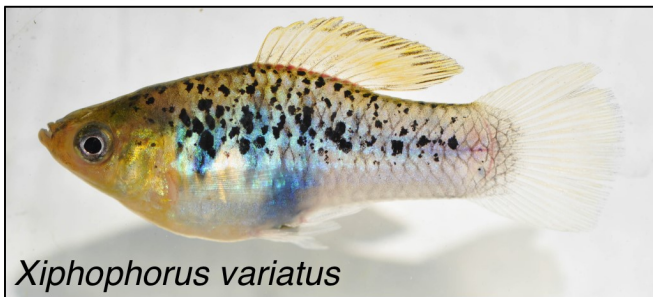


*Carlhubbsia kidderi*



*Xiphophorus pygmaeus*

## Example of male anal spots and similar spots in the anal region



*Xiphophorus variatus*



*Xiphophorus cortezi*



*Priapichthys cf. puetzi*



*Phallichthys fairweatheri*

that the spots are most pronounced in the final stages of pregnancy, which appears to be true for some species. However, studies on some *Gambusia* species revealed that the spots are most pronounced when eggs are present in the ovaries, and smallest when offspring are about to be born. In addition, there are poeciliids (perhaps most prominently the Black-bellied *Limia*, *Limia melanogaster*) that exhibit a pronounced spot around the anal region permanently. Hence, when and why females exhibit gravid spots does not seem to be consistent across species, and the functions that have been proposed for pregnancy spots remain unclear. The general consensus is that they play a role communicating with males during reproduction. But whether they serve as an advertisement (indicating high fertility or willingness to mate), or whether they dissuade males from mating, is not quite clear. Case in point, gravid spots signal a female's willingness to mate in Western mosquitofish (*Gambusia affinis*), but they signal non-receptivity in Sailfin mollies (*Poecilia latipinna*).

So, gravid spots in females may or may not be correlated with pregnancy stage, but they almost certainly function in communication between males and females during reproduction. It is therefore not entirely surprising that there are species in which males also exhibit dark pigmentation around the anal regions. Male anal spots most certainly occur in some populations of the Variable platyfish (*Xiphophorus variatus*), the species of platyfish I presume you keep. In addition, male anal spots are present in some species of the genus *Brachyrhaphis*, *Girardinus*, *Poeciliopsis*, and other species of *Xiphophorus*. In addition, males of some species have spots on or around the anal fin that are reminiscent of anal spots (e.g., *Priapichthys* and *Phallichthys*). There are no systematic studies on the function of male spots around the anal region, but I would assume that they are involved in courtship displays and advertising toward females. Alternatively, males with anal spots in some species may be trying to mimic females. Many livebearers are known to have coercive mating strategies, where males don't court but rely on forced copulations with uncooperative females. Mimicking females might allow such males to trick unsuspecting mating partners. Clearly further research is required for us to better understand the role of anal spots, both in females and in males.

*“Ask a Scientist” requires your input. Have you ever wondered about the meaning of observations you made in your fish tank? Do you have questions about the behavior, reproduction, ecology, or evolution of livebearers? Submit your questions directly to Michi (tobler@ksu.edu). He will do his best to answer your question or find somebody that can!*