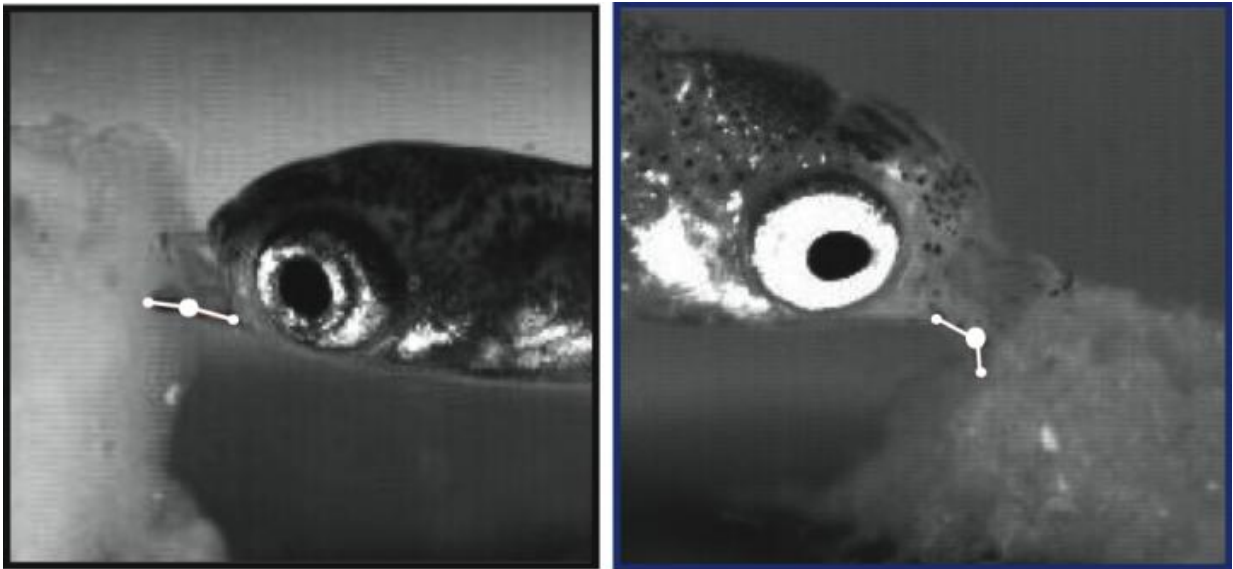


Into a competitive world, guppies are born not just bigger, but more mature

July 31 2017



A guppy born in a less competitive environment (left) has a less mature jaw that doesn't swing as widely, while a guppy born to more competition for food (right) has a jaw that opens wider at a key joint. Credit: Terry Dial

Throughout nature, moms engage in a trade-off: Churn out a bevy of offspring and hope for the best, or have fewer kids but invest more in their survival. Trinidadian guppies provide a model example of this pervasive parenting poser, but a new study by Brown University researchers provides uniquely deep insight into how guppy moms equip their babies for the environment they'll face.

Essentially one of two fates confront the guppies who inhabit the South American island's mountain streams. Guppies who live lower down the mountain face a constant threat of predators. Fish higher up the slope live a relatively predator-free life, but it's no paradise because in waters teeming with fellow guppies, the competition for limited food is stiff. Up to now, what scientists had observed is that guppy moms in the high-predation (HP) waters produced scads of smaller young while guppies in the low-predation areas (LP) produced fewer but larger young.

In the new study in *Scientific Reports*, Brown postdoctoral researcher Terry Dial and colleagues report that the size difference of a couple of millimeters of length may not be the most meaningful one. Instead, the larger guppies in the LP streams are born significantly more mature, at least where it counts for their way of eating. It's their internal anatomy that may promote their survival.

LP guppy mouth joints swing twice as widely (22 degrees instead of 11), the researchers found. As a result their jaws open to a bigger gape. The heads of LP guppies are 90 percent hardened at birth, while HP guppies are only 20 percent hardened. Finally, the muscles controlling the jaws are bigger in LP guppies. Eventually, HP guppies will catch up - if they survive - but LP guppies are born better at scraping algae and diatoms off stream rocks for dinner.

"There is more to it than just an investment in sheer size," Dial said.

"This is the first time we'd really gone into the morphology and anatomy of these animals and tried to tease apart what is different about these fish other than just size."

Dial found that not only were the HP and LP populations significantly different in this regard, but also the larger newborns within LP populations were significantly more mature than the smaller newborns in LP populations.

Of course the [guppies](#) aren't consciously strategizing. Instead, Dial said, evolution in LP environments apparently selects for moms that produce more fully mature newborns, because those babies are better at competing for food and are therefore more likely to survive and carry on mom's lineage. On the other hand, in HP streams where the main danger is predators, evolution may favor moms who produce so many young, because surely some number will survive to grow up and reproduce without being eaten.

"The mother's fitness is tied into the offspring's fitness," Dial said.

More information: T. R. Dial et al, Morphological and functional maturity of the oral jaws covary with offspring size in Trinidadian guppies, *Scientific Reports* (2017). [DOI: 10.1038/s41598-017-06414-6](https://doi.org/10.1038/s41598-017-06414-6)

Provided by Brown University

Citation: Into a competitive world, guppies are born not just bigger, but more mature (2017, July 31) retrieved 18 April 2024 from <https://phys.org/news/2017-07-competitive-world-guppies-born-bigger.html>

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