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www.elsevier.com/locate/developmentalbiology

PII: S0012-1606(18)30085-X
DOI: https://doi.org/10.1016/j.ydbio.2018.06.004
Reference: YDBIO7786

To appear in: *Developmental Biology*

Received date: 31 January 2018
Revised date: 3 June 2018
Accepted date: 4 June 2018

Cite this article as: Misty R. Riddle, Werend Boesmans, Olivya Caballero, Youcef Kazwiny and Clifford J. Tabin, Morphogenesis and motility of the *Astyanax mexicanus* gastrointestinal tract, *Developmental Biology,* https://doi.org/10.1016/j.ydbio.2018.06.004

Morphogenesis and motility of the *Astyanax mexicanus* gastrointestinal tract

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Abstract

Through the course of evolution, the gastrointestinal (GI) tract has been modified to maximize nutrient absorption, forming specialized segments that are morphologically and functionally distinct. Here we show that the GI tract of the Mexican tetra, *Astyanax mexicanus,* has distinct regions, exhibiting differences in morphology, motility, and absorption. We found that *A. mexicanus* populations adapted for life in subterranean caves exhibit differences in the GI segments compared to those adapted to surface rivers. Cave-adapted fish exhibit bi-directional churning motility in the stomach region that is largely absent in river-adapted fish. We investigated how this motility pattern influences intestinal transit of powdered food and live prey. We found that powdered food is more readily emptied from the cavefish GI tract. In contrast, the transit of live rotifers from the stomach region to the midgut occurs more slowly in cavefish compared to surface fish, consistent with the presence of churning motility. Differences in intestinal motility and transit likely reflect adaptation to unique food sources available to post-larval *A. mexicanus* in the cave and river environments. We found that cavefish grow more quickly than surface when fed *ad libitum,* suggesting that altered GI function may aid in nutrient consumption or absorption. We did not observe differences in enteric neuron density or smooth muscle organization

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