Characterizing the digestive enzyme ontogeny and larval digestive tract morphology of *Lachnolaimus maximus* to inform nutritional protocols for aquaculture production

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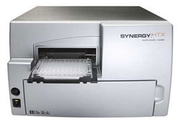
Introduction

- Developing aquaculture protocols for hogfish would allow for commercial production to meet market demands while simultaneously creating opportunities for stock enhancement
- Larval production must first be optimized, which includes feed types and weaning schedules
- Objective: identify timepoints at which larvae can be weaned from costly copepod nauplii to more cost-efficient rotifers

Methods

Developmental Trial



- Goal: identify key digestive developmental timepoints to guide weaning protocols
- Measured digestive enzyme activities throughout the larval period via spectrophotometric microplate assays
- Examined changes in digestive tract morphology using histology

Weaning Trial

- Goal: identify the earliest point at which larvae can be transitioned from copepod nauplii to rotifers
- Control – all copepod nauplii
- Rotifer introduction at 3, 6, or 9 dph (days post hatch)

- 750 embryos stocked into each of 24 15L tanks (n=6)
- Length and survival measured after 15 days

Results

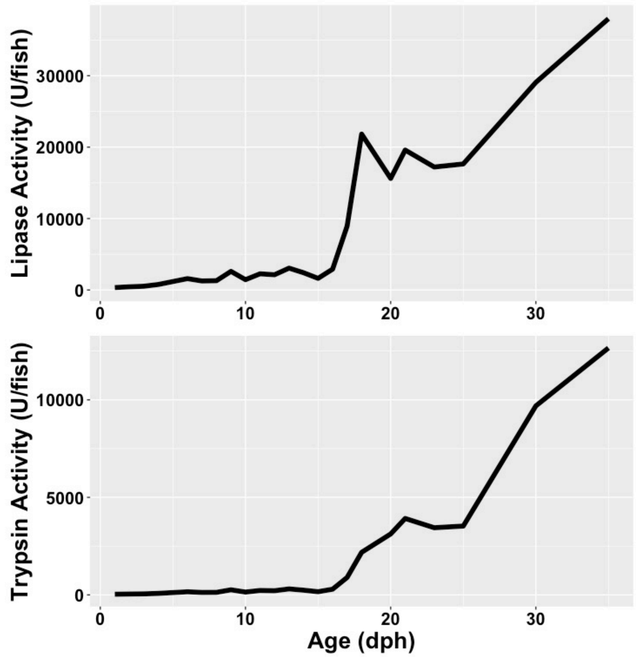


Figure 1. Lipase (top) and trypsin activity (bottom) of *L. maximus* larvae from 2 to 45 dph. Digestive enzyme activities are measured as Units/fish.

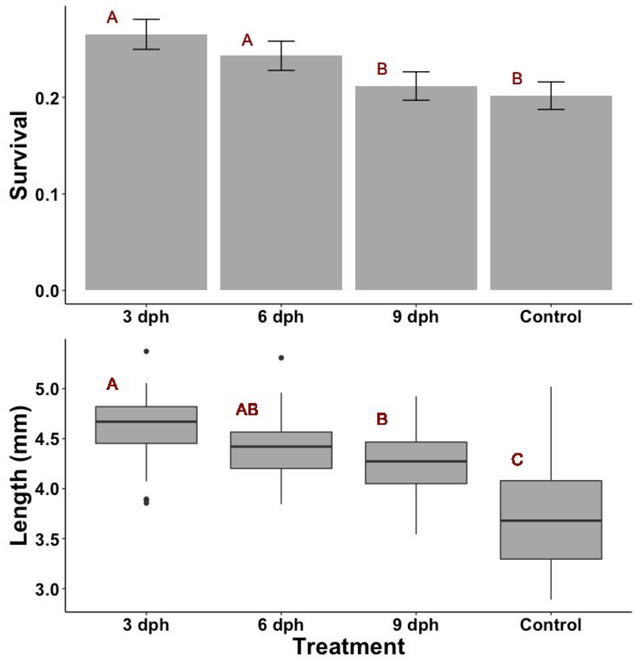


Figure 2. Proportion of hogfish larvae (+/- SE) alive at 15 dph (top) and total length (mm) of larvae at 15 dph (bottom). GLMM with Bernoulii distribution and estimated marginal means post hoc; letter above bars denote significance.

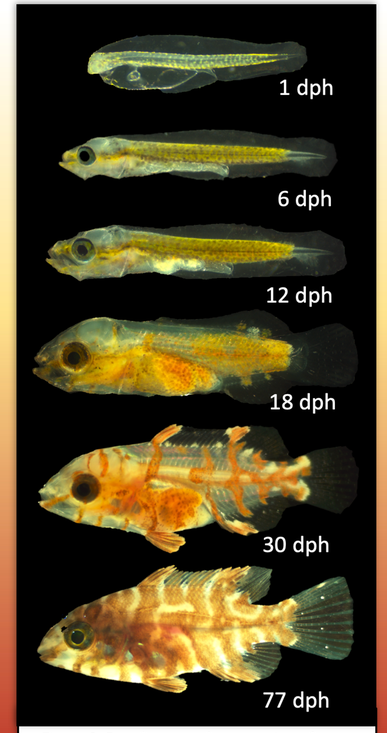


Figure 3. Developmental progression of hogfish larvae from 1 to 77 dph (not to scale).

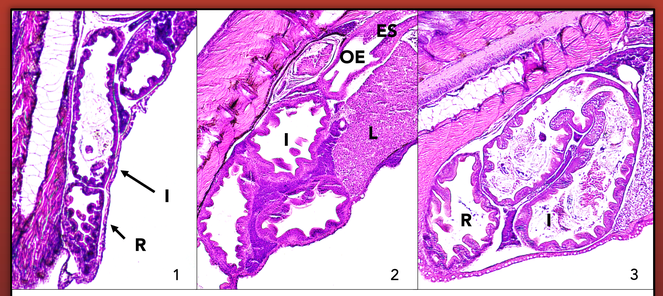


Figure 4. Histological sections of larval digestive tract (H&E) at 10 dph (1, 40X), 16 dph (2, 40X), and 18 dph (3, 40X). I = intestine; L = liver; R = rectum, ES = esophagus, OE = oesogaster.

Conclusions

- The larval period was characterized by swim bladder inflation at 7 dph, notochord flexion at 18 dph, and transition to the adult mode of digestion after 18 dph
- Like other wrasse species, hogfish larvae do not develop a stomach
- A pouch-like structure ("oesogaster") located after the esophagus was identified
- Larval survival and total length was highest when rotifers were introduced at 3 and 6 dph
- Next steps: conduct a weaning trial to transition hogfish from rotifers to an inert microdiet

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Topic: Digestive enzyme & tract morphology

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