Embryos in Waiting: Embryological Insights into Desiccation Resistant Non-Annual Fish

THE GEORGE WASHINGTON UNIVERSITY
WASHINGTON, DC

Anais Hayes, Andrew W. Thompson, Hartmut Doebel,Guillermo Orti
Department of Biological Sciences, The George Washington University

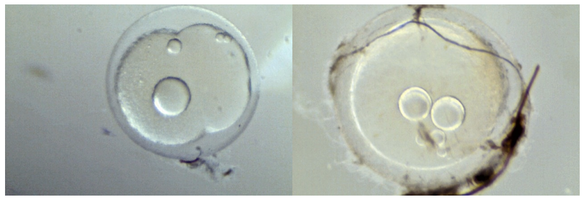
Introduction

- Both *Aplocheilus lineatus* and *Epiplatys sexfasciatus* are non-annual killifish within the group known as *Aplocheoldel.*
- Current research does not indicate that either species undergoes metabolic dormancy, i.e. diapause (as annual killifish do), but are capable of enduring environmental stress and have been known to hatch after periods of time spent in dry environmental conditions. Anecdotal evidence has noted that *A. lineatus* has been known to hatch after dry periods lasting as long as a month.
- These anamniotic eggs are characterized by thick chorions, a nucleus at the animal pole, development of a clear yolk outline, and large amounts of yolk which is present in the egg up to and past the pre-hatching stage, facilitating survival.
- The creation of a developmental timeline is the first step int eh creation of comparative transcriptome date, as well as the compilation of the survival trade-offs present within the *Aplocheilidae* family.

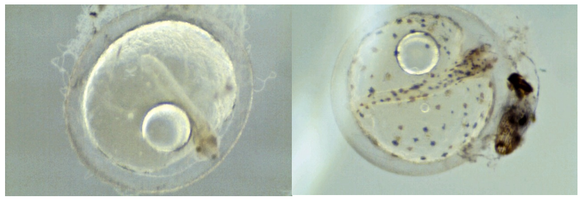
Objectives

- Obtain sufficient data to create a pictorial timeline, with expected physical characteristics of *A. lineatus* and *E. sexfasciatus* embryological development.
- Develop marine methods for use in future trials.
- Collect sufficient embryonic data to aid in comparative transcriptome endeavors.

E. sexfasciatus Results



Epiboly Stage *Blastula Stage*



Early Neurula Stage *Late Neurula Stage*

Somite Completion Stage *Pre-Hatching Stage*

Figure 1: Developmental stages of E. sexfasciatus

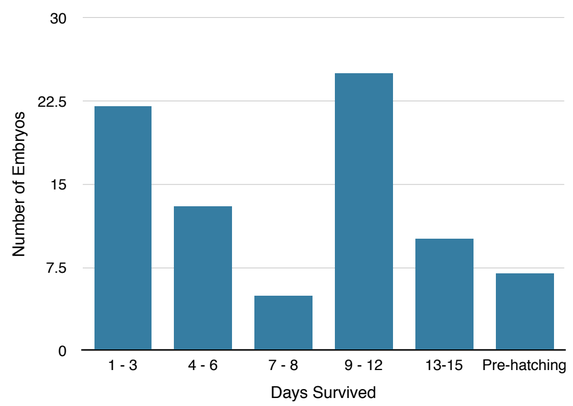


Figure 2: Survival rates of E. sexfasciatus while in aquatic conditions, indicating a low survival rate initially and prior to pre-hatching stage

A. Lineatus Results

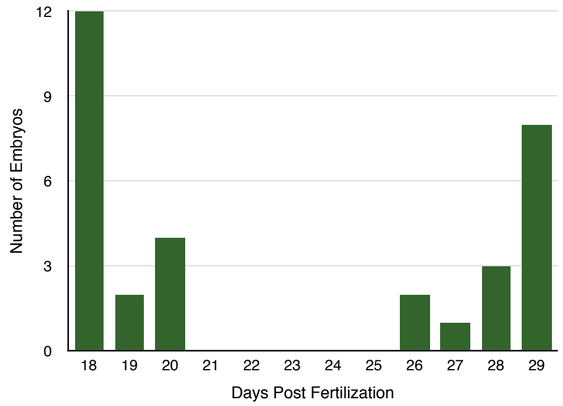
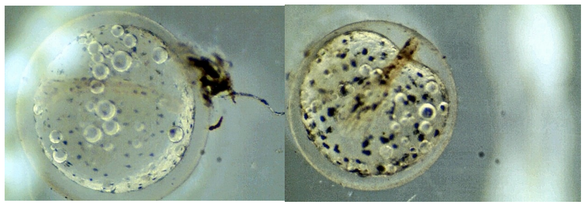
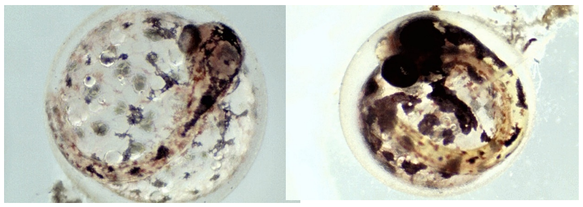


Figure 3: Hatching rate of A. lineatus, with an inverse bell curve indicating a hatching delay while in pre-hatching stage
Figure 4: Embryological development of A. lineatus

Epiboly Stage *Blastula Stage*



Early Neurula Stage *Late Neurula Stage*



Somite Completion Stage *Pre-Hatching Stage*

Methods and Materials

- Males and females of both species were bred in respective tanks, with the preferred fauna for breeding.
- Eggs were collected every 24 hours and kept at 27 C; pictures were taken daily.
- The Medaka developmental stages guide was used to identify key features.

Preliminary Conclusions

- Results were observed under optimal conditions, which provides insight into the developmental plasticity present in non-annual fish.
- The hatching timeline of *A. lineatus* indicates the potential use of "bet hedging" to aid survival past the pre-hatching stage.
- Survival rates of *E. sexfasciatus* indicate little resilience under optimal conditions, and thus potential little desiccation resistance.

Future Research

Future trials will focus on *A. lineatus* embryos exposed to varying humidity levels. Additional genomic insights into the species' response to such inhospitable conditions will come from a comparative transcriptomics between embryos in aqueous and terrestrial conditions.

Acknowledgements:

We would like to thank the Harlan Foundation, Dr. Tara Scully, The George Washington University, Jeong Choi, and Meheret Mckonnen for their help in this project.