



Enhancing pupation rates of captive *Heterelmis comalensis*

What do we know?

- ▶ Pupae are exarate
- ▶ Float in association with air bubble
- ▶ Take less than 1 month to transform into adult



Previous work

- ▶ Related species pupate outside of water

- ▶ White 1978; Brown 1987

- ▶ *Heterelmis comalensis* can pupate while submerged

- ▶ Huston and Gibson 2015



Huston and Gibson 2015

Natural habitat



- ▶ Spring upwellings and seeps at Comal Springs
- ▶ Atmospheric gasses become trapped under rocks
 - ▶ LBG-Guyton Associates 2004
- ▶ Other localities?

Previous success

- ▶ Flow-through tubes
 - ▶ Huston and Gibson 2015
- ▶ About 20% of larvae pupated
 - ▶ BIO-WEST 2017
 - ▶ Ca. 2572 degree days



New ideas

- ▶ Air bubble requirement
- ▶ Starvation may initiate pupation
- ▶ *Heterelmis comalensis* may retain the plesiomorphic state of pupation behavior



Huston and Gibson 2015

Proposed research – Objectives

- ▶ Reexamine the utility of flow-through tubes
- ▶ Explore starvation as trigger mechanism
- ▶ Examine terrestrial habitats
- ▶ Construct an apparatus that emulates bubble stream conditions
- ▶ Examine and assess beetle fitness



Proposed research

- ▶ Use flow-through tubes that sustain air pockets
- ▶ Use different materials to pack tubes
- ▶ Examine individuals after given number of degree days
- ▶ Launch two groups of 20 individual 7th instar larvae every month
 - ▶ Target 14 groups total



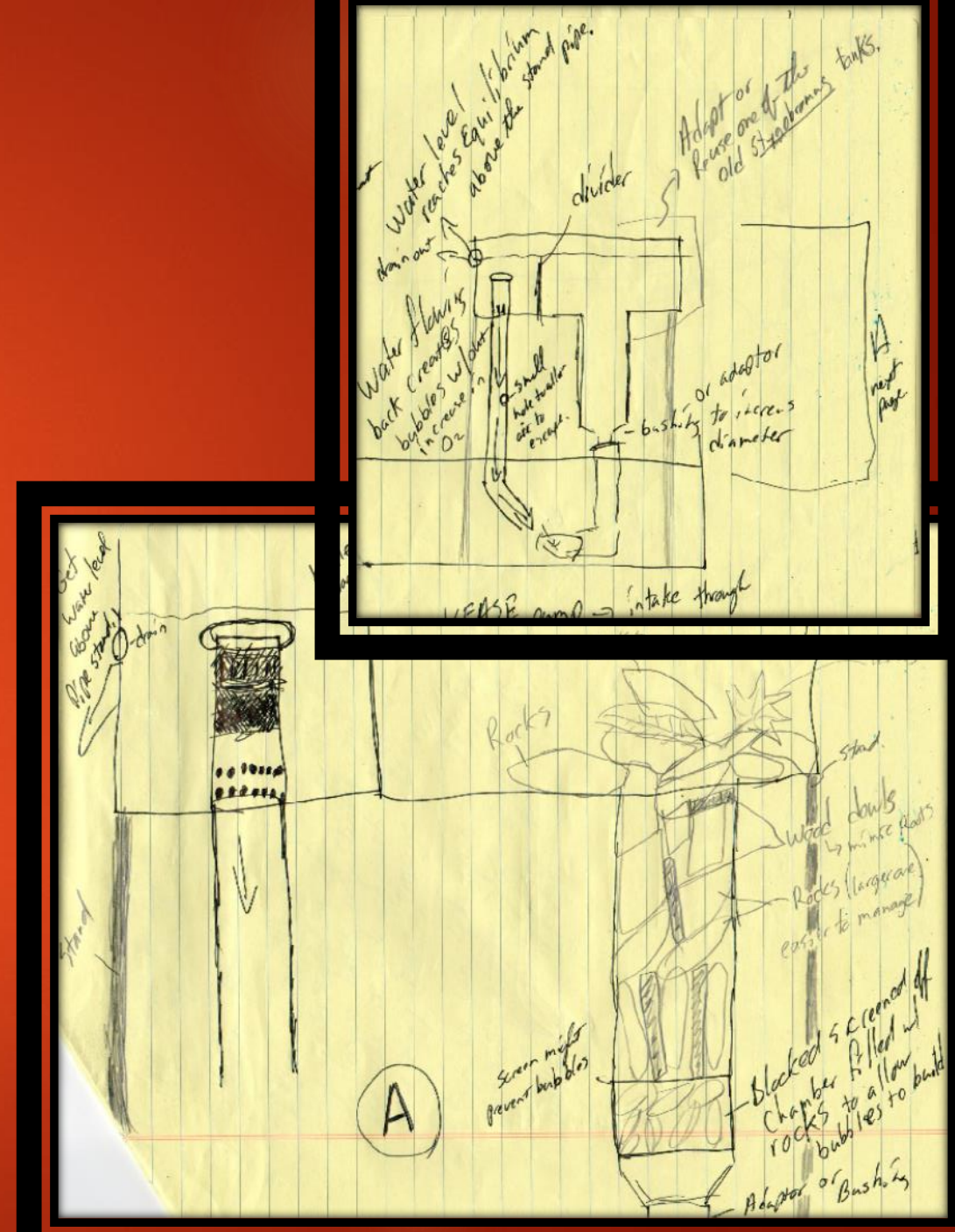
Proposed research

- ▶ After 1st retrieval count pupae and adults
- ▶ Break up larvae into 3 groups:
 - ▶ Relaunch
 - ▶ Starvation
 - ▶ Tube with plastic substrates
 - ▶ Terrestrial
 - ▶ Container with humid conditions
- ▶ Run new treatments for 1 month
- ▶ Examine fitness of remaining larvae



Proposed research: Tinny bubbles

- ▶ Construct a flow-through semi-recirculation apparatus
- ▶ Trap gasses within the apparatus to simulate Comal Springs
- ▶ Three groups of 25



Proposed work

Assessment

- ▶ Examine larvae for prepupal characteristics
- ▶ Weigh treatment groups before and after
 - ▶ Fitness increased or decreased
- ▶ Adults measured to compare fitness between treatments (BIO-WEST 2017)
- ▶ Egg production comparisons Ψ
 - ▶ Do some treatments result in more fecund females?



Konopova and Jindra 2008

Adaptive management



- ▶ Reiterative experiments allow for modifications to designs as new information is learned
- ▶ Timing
- ▶ Substrate types
- ▶ Identification of larvae that are conditioned to pupate
- ▶ Habitat quality (temp, dissolved oxygen, etc...)
- ▶ Change in air supply



Questions?

