

A Developmental Study of the Marine Crustacean
“Paryhale hawaiiensis”:
the role of the marsupium in growth and survival

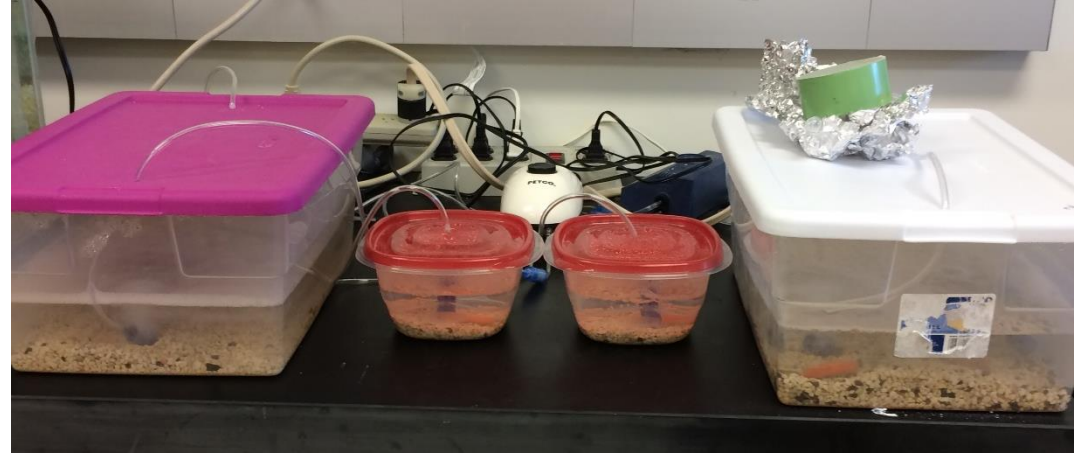
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University of Cincinnati Senior Capstone 2019

Background

Research Question: Embryos can be removed from female marsupium at a single cell for detailed study and manipulation, how does stage removed affect survival and growth once hatched?

Hypothesis: Stage an embryo removed (single cell, mid stage, late stage) effects growth and survival of juveniles.



Colony Setup



Paryhale hawaiiensis

Methods

1. Identify stage



2. Anesthetize in clove oil



3. Forceps retraction, isolate embryos



Growth over Time



Day 1



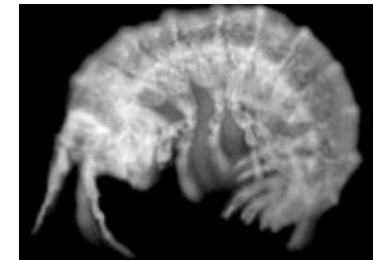
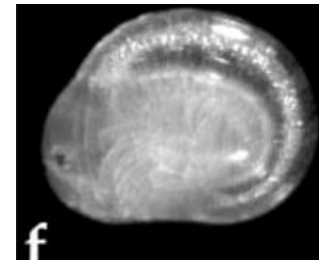
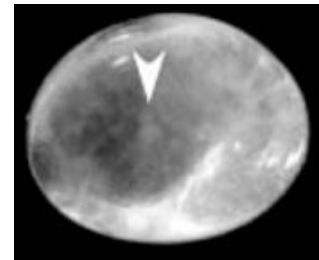
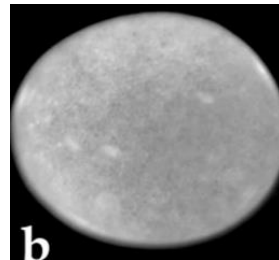
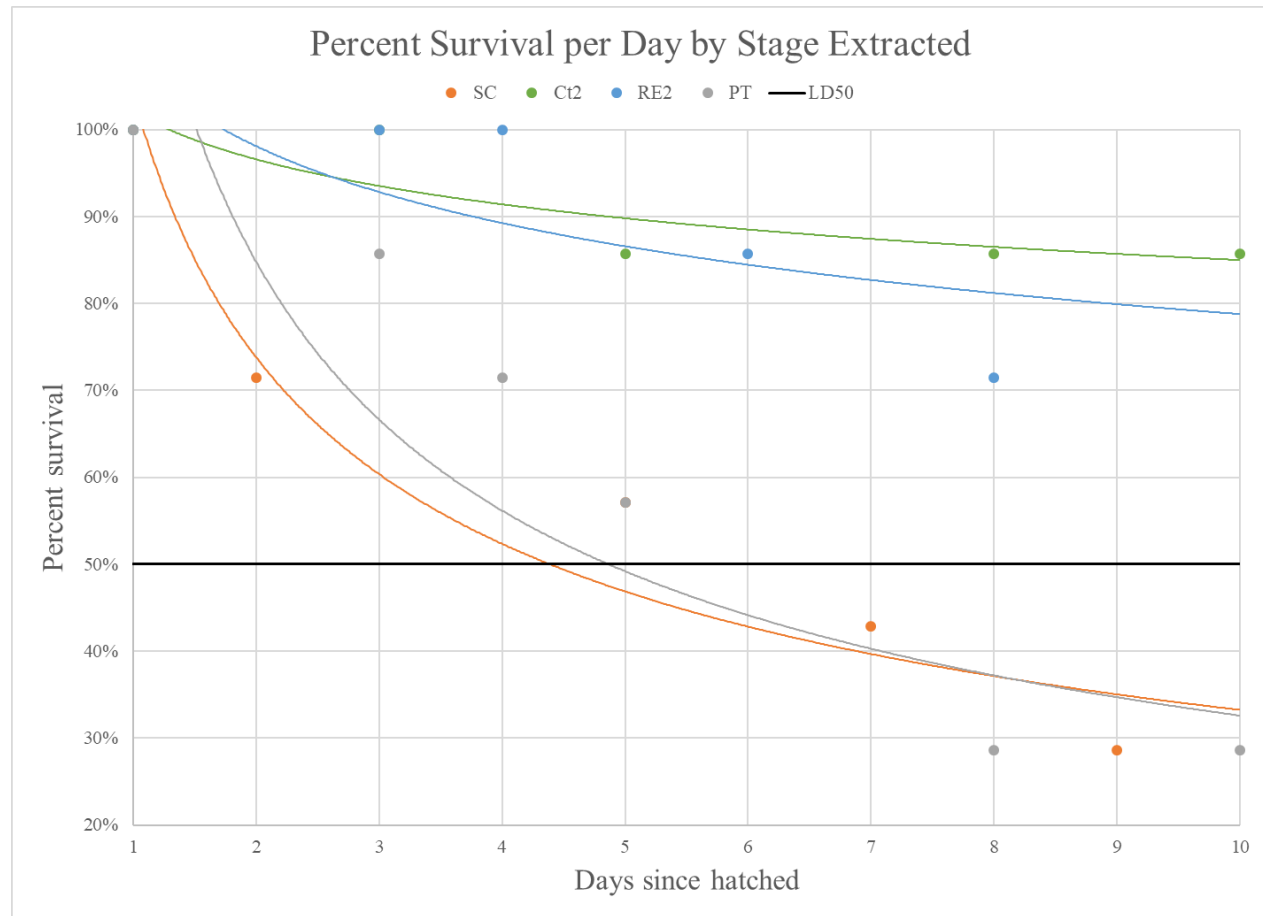
Day 3



Day 10

Results

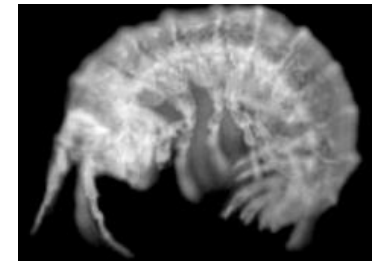
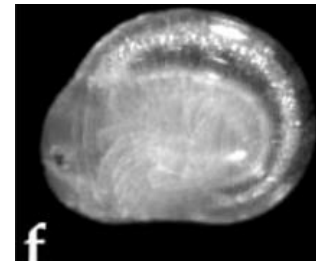
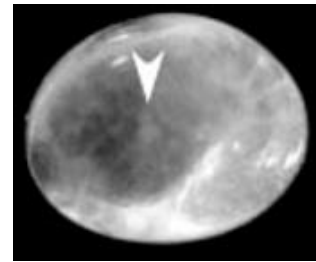
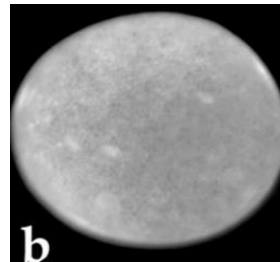
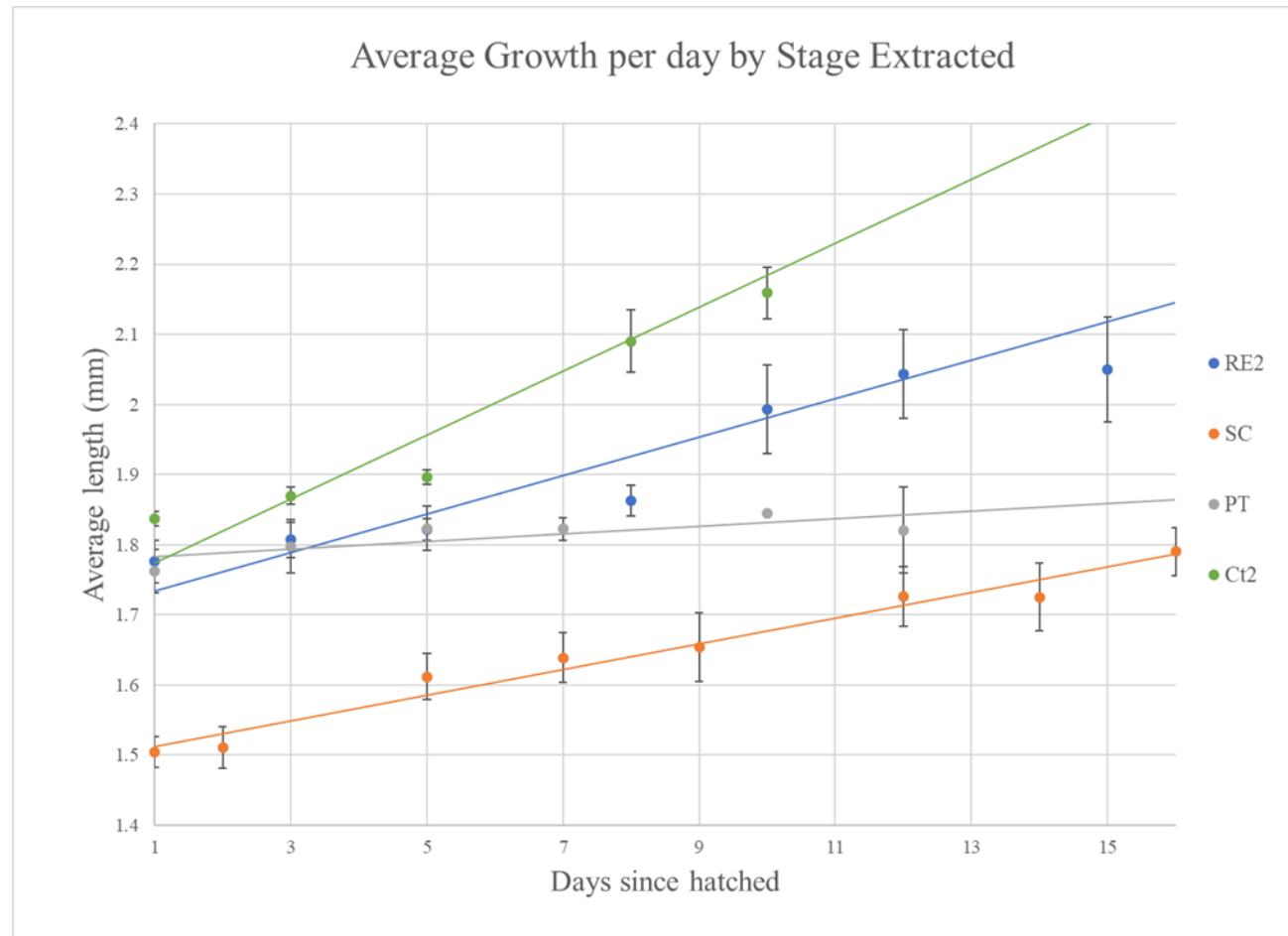
- Lower initial survival % for juveniles extracted earlier stage. Both Single Cell and Paddle Tail (mid-stage) hit LD 50, at 5 days since hatched.
- Limb dysmorphia and bacterial growth observed for higher proportion juveniles removed SC and PT.



Source: Browne, William E., et. al. "Stages of Embryonic Development in Amphipod Crustacean, *Paryhale hawaiiensis*"

Results

- Significant difference in growth rate between each stage.
- Analysis: 2-Way ANOVA test model effect of days since hatched and stage extracted on length
- Tukey HSD test for multiple pairwise comparison.



Source: Browne, William E., et. al. "Stages of Embryonic Development in Amphipod Crustacean, *Paryhale hawaiiensis*"

Final Thoughts

➤ **Overview:**

- Single Cell and Mid Stage embryos showed lower survival rate.
- Removal from the marsupium at any stage has a significant effect on juvenile growth
- Critical window in embryological development

➤ **Future Research:**

- RNA sequencing for Differential Expression between stages
- Comparative study microbiome diversity between stages

Questions?

Statistical Tests

Tukey multiple comparisons of means

95% family-wise confidence level

Fit: aov(formula = len ~ stage * days_hatched)

stage	diff	lwr	upr	p adj
PT-CT2	-0.16855654	-0.225292016	-0.11182107	0.000000
RE2-CT2	-0.10961082	-0.164048351	-0.05517329	0.000006
SC-CT2	-0.40073529	-0.459679186	-0.34179139	0.000000
RE2-PT	0.05894572	0.001316719	0.11657472	0.043004
SC-PT	-0.23217874	-0.294082221	-0.17027527	0.000000
SC-RE2	-0.29112446	-0.350928905	-0.23132002	0.000000

2-Way ANOVA

Fit: aov(formula=len~stage*days_hatched)

Response: len	Df	Sum Sq	Mean Sq	F value	Pr(>F)
stage	3	2.0491	0.6830	109.399	< 2e-16 ***
days_hatched	4	0.5602	0.1400	22.431	1.4e-12 ***
stage:days_hatched	12	0.1659	0.0138	2.214	0.018 *
residuals	83	0.5182	0.0062		