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Tadpole density changes the relationship of red-eyed treefrog morphology and jumping performance [poster]

Julie Charbonnier
Virginia Commonwealth University, charbonnierj@vcu.edu

T. Landberg
Boston University

Tadpole density changes the relationship of red-eyed treefrog morphology and jumping performance

Julie F. Charbonnier[1] & Tobias Landberg[2], [1]Virginia Commonwealth University, VA and [2]Boston University, MA (charbonnierj@vcu.edu)

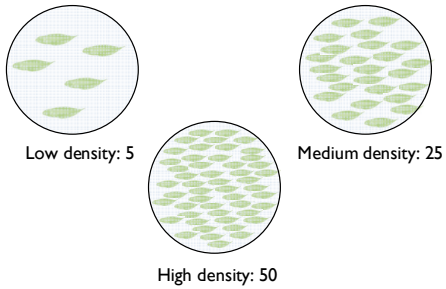
Introduction

As organisms develop, increased body size is often accompanied by shape changes that alter the morphology-performance relationship. Animals with different growth histories may also have different shapes at similar body sizes. We investigated the effects of larval growth history on the morphology and performance of red-eyed treefrog (*Agalychnis callidryas*).

Predictions: Tadpoles reared at low density will have larger body size and relatively longer legs than those reared at high density, resulting in higher absolute and relative jumping performance.

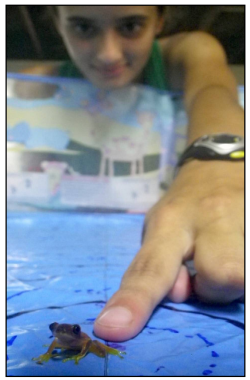
Experimental design

Red-eyed treefrog tadpoles were raised in 400 L mesocosms at three densities, each replicated 5 times:



Following metamorphosis, we measured mass, snout-vent length (SVL), tibiafibula length (TF) and tail length.

Experimental mesocosms in Panama



We measured jump distance to the nearest 2.5 cm and used the average of three jumps for each frog (n=227) in our analyses.

Results– morphology

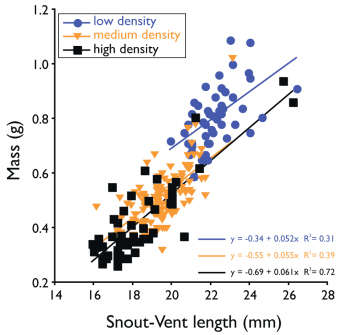


Fig. 1. SVL and mass are positively correlated, but for a given SVL, low density frogs have higher mass.

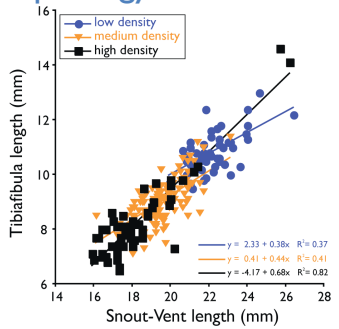


Fig. 2. SVL and tibiafibula are positively correlated in all three treatments.

Results– jumping performance

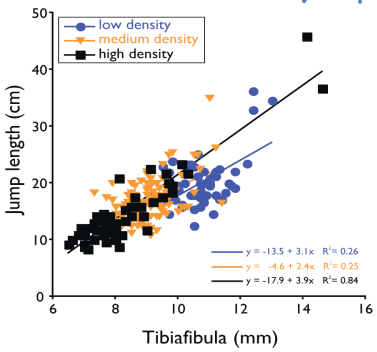


Fig. 3 Longer TFs were correlated with longer jump distances, but for a given TF length, frogs from low density tanks did not jump as far.

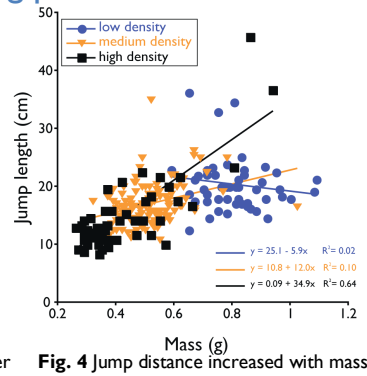


Fig. 4 Jump distance increased with mass among frogs from high and medium density tanks but not low density tanks.

Analysis of covariance (ANCOVA) for average jumping distance (n=227, R^2= 0.63)

Source	DF	F ratio	P value
Density	2	3.93	0.021
SVL	2	9.46	0.002
Tibiofibula	1	43.4	<.0001
Tail length	1	6.74	0.010
Mass	1	.331	0.566
Mass * TF	1	1.12	0.292
Mass * TF* density	2	4.05	0.019
SVL *density	2	4.00	0.020

Discussion

Different larval densities change not only red-eyed treefrog morphology, but the morphology-performance relationship. Our results suggest a trade-off where low larval density increases body size and makes them relatively heavier and longer legged. The relatively long legs of these low density frogs may partially compensate for their disproportionately greater mass, but not completely since tadpoles raised at low density become frogs that do not jump as far for their size as tadpoles raised at lower densities. These results suggests that the cost of relatively low jumping performance may be offset in some other way. For example, large heavy frogs may resist desiccation or starvation better.

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