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Dragonfly Nymphs Increase the Tail Height of Tadpoles: Measuring the Morphology and Motion by Image Processing

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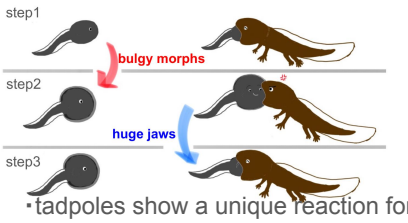
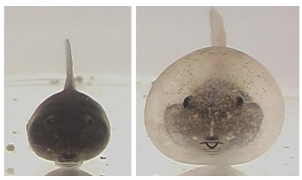
Background

Tadpole can acquire a bulgy phenotype as a defense against the larval salamanders

tadpole prevent swallowing



morphological defense



A: No natural enemy
B: Dragonfly larva（Aeshna crenata）
C: Hynobius retardatus

- tadpoles show a unique reaction for Japanese giant salamander.(c)
- Tadpoles return to No natural enemy, if natural enemies are no longer present.
- they can acquire a “high-tail” phenotype in response to predation risk from Aeshna nigroflava (dragonfly) larvae.

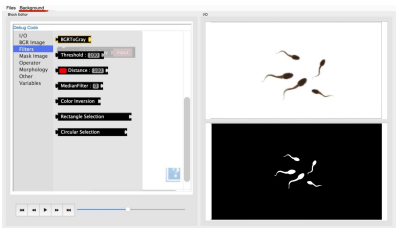
Tadpole has flexible morphological defense.

Purpose

It is not yet clear whether longer tail lengths actually increase explosive power and enable the tadpole to escape from predators more quickly. Therefore, we decided to clarify this through two experiments.

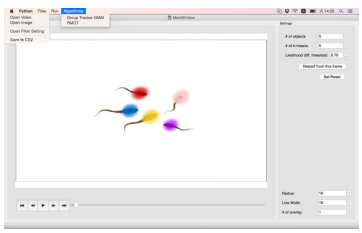
UMA Tracker

1.UMATracker-FilterGenerator



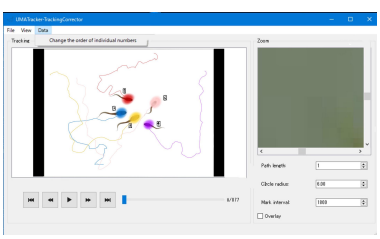
→Video preparation

2.UMATracker-Tracking



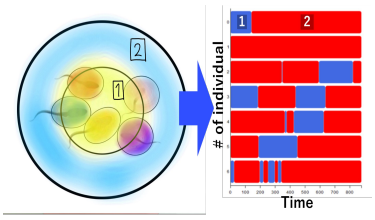
→Tracking individuals.

3.UMA Tracker-TrackingCorrector



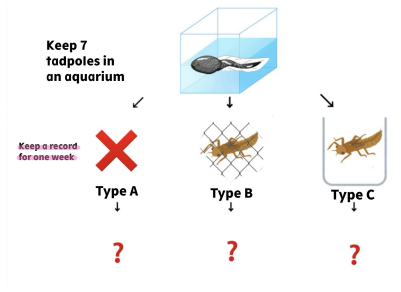
→Modify the results.

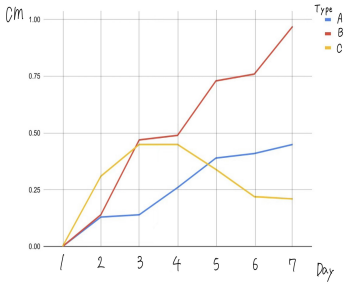
4.UMA Tracker-Area51



→Analyze the results.

Experiment1

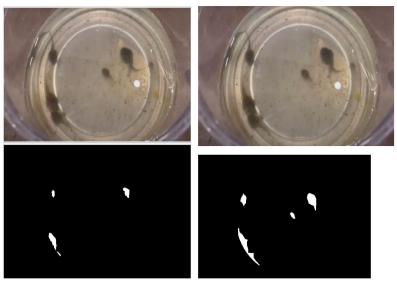




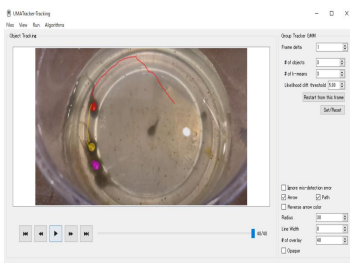
-Type A: Only tadpoles are kept in the tank.
-Type B: Dragonfly larvae are kept in a beaker within the same tank as the tadpoles.
- Type C: Dragonfly larvae are kept in a net within the same tank as the tadpoles.

Experiment2

1.UMA Tracker-FilterGenerator



2.UMA Tracker-Tracking



Using the UMATracker-FilterGenerator , we processed videos of swimming tadpoles. The processed videos have a monochrome mask applied, with the moving subject (the tadpoles) shown in white and the background in black.
This allows us to track the movement of the subject.

Future perspective

In future experiments, we plan to capture frogs that live between autumn and winter, inject them with hormones, induce them to lay eggs, and artificially inseminate them to use in our experiments.

References

Tadashi Iwami Osamu Kishida co Kinya Nishimura. Direct and Indirect Induction of a Compensatory Phenotype that Alleviates the Costs of an Inducible DefenseOctober 31, 2007

OsamuYamada, Rito Takeuchi “UMAYracker” GitHub Pages

Kishida, O. & Nishimura, K. (2004) Bulgy tadpoles: inducible defense morph. Oecologia 141:414-421.
September 2004