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Modeling predator-prey equations for *Ambystoma tigrinum* in the presence of phenotypic plasticity

Phenotypic plasticity is the ability of an organism to mature into a variety of phenotypes from a single genotype. *Ambystoma tigrinum*, the tiger salamander, is a classic example of this phenomenon. A species of salamander widespread in the U.S., the tiger salamander hatches from eggs into an aquatic larval form. In a ``typical" growth trajectory, the larval form matures into an adult salamander capable of terrestrial life, then becomes sexually mature. Other trajectories include remaining in a legless aquatic form but maturing sexually to carry out the entire life cycle in the water or, in a variant of this, developing huge jaws in the juvenile stage and becoming an aquatic, largely cannibalistic predator. The model we construct has four trophic levels. Fairy shrimp and other minute organisms at the bottom of the food chain are eaten by recently hatched salamander larvae, or ``young of the year" and also by an assortment of other predators of similar size. The young of the year mature into one of two possible forms, either a larger larva that is a sexually immature juvenile or a cannibalistic form of the juvenile. These in turn mature into three forms of adult capable of reproduction. We show that that the various populations of *Ambystoma tigrinum* are highly sensitive to small variations in the morphological choice, both in the full model and in a all submodels including more than one adult phenotype. The model is also shown to display limit cycles for some parameter choices.

This research was conducted with the assistance of 64 undergraduates in two sections of a course in differential equations.

Keywords:
Ecology, Ecosystems, Evolutionary biology