

Reproductive plasticity revealed: Neotropical treefrog can choose to lay eggs in water or on land

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When frogs reproduce, like all vertebrates, they either lay their eggs in water or on land – with one exception, according to new research by a team of Boston University scientists who discovered a treefrog (*Dendropsophus ebraccatus*) in Panama that reproduces both ways. The neotropical frog makes a behavioral decision to lay egg masses aquatically in a pond or terrestrially on the overhanging plants above a pond, where the newly-hatched tadpoles simply fall into the water.

The dual reproductive capabilities enable this species of tree frogs to choose the best environment for egg development avoiding either aquatic predators or the hot tropical sunlight that dries out the eggs. In two shady forest ponds the mating frogs laid terrestrial egg masses, as expected from previous research. In a third pond in an old gravel quarry without a forest canopy, the vast majority -- 76 percent -- of the eggs were laid in water, supported by aquatic vegetation. The remaining 24 percent were on leaves above the pond, although the mortality rate of these eggs was high due to the heat and lack of shade.

The study, “Reproductive Mode Plasticity: Aquatic and Terrestrial Oviposition in a Treefrog,” by BU graduate student Justin C. Touchon and Assistant Professor of Biology Karen M. Warkentin appears in the *Proceedings of the National Academy of Science* online this week.

To test if genetic differences made frogs lay eggs in water or on land, or

if instead their different environments affected egg-laying choices, Touchon and Warkentin built miniature ponds in an open field and in the forest. When they placed pairs of mating treefrogs in the shaded ponds, the frogs laid eggs on leaves above the water. In unshaded ponds, however, frogs put most of their eggs in the water.

Although this frog is the first vertebrate discovered to show reproductive flexibility, Touchon and Warkentin emphasize that it is probably not alone. The way an animal reproduces has been viewed as fixed, since most aquatic eggs die on land, and terrestrial eggs drown in water. This little yellow treefrog shows us such inflexibility is not universal.

Thus, the evolutionary change from aquatic to terrestrial eggs -- which has happened many times -- may not be a dichotomous switch but instead represent movement along a continuum.

Touchon and Warkentin suggest that this treefrog “could represent an intermediate stage in the evolution of terrestrial reproduction, combining a retained ancestral capacity for aquatic development with a derived ability for terrestrial oviposition and development.” This discovery opens new avenues of research into the evolution of reproduction on land. The treefrog’s ability to vary where it lays its eggs might also help it cope with changes in its environment, improving its chances of surviving habitat clearing or climate change.

Source: Boston University

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