

## Tree frogs speed up their life cycle when becoming lunch

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A katydid preys on the eggs of a Hansen's tree frog. Credit: Sheila Poo

Think again if you've always believed that events in the life cycle of animals happen consistently, almost rigidly, as part of the natural rhythm of nature. Studies by Sinlan Poo and David Bickford of the National University of Singapore, Singapore, show that Mother Nature is much more flexible than you might think. In a paper in Springer's journal *Behavioral Ecology and Sociobiology*, the researchers describe how Hansen's tree frog (Chiromantis hansenae) speeds up its life cycle to hatch earlier once its eggs are preyed upon.

Hansen's tree frog is found in Thailand and parts of Cambodia. In the



rainy season, gelatinous masses of its eggs can be seen on plants overhanging seasonal pools. Moments before they are due to hatch, the entire clutch detaches from the plant to drop into the water below. The hatchlings then almost immediately emerge from the gelatinous mass in which they developed. This whole process sounds easier than it actually is, because a type of katydid (*Hexacentrus* cf. unicolor) frequents these pools and is known to eat both adult frogs, and their eggs.

The study was conducted at an open air laboratory at the Sakaerat Environmental Research Station in Thailand, where the frogs were kept in glass aquariums and the researchers used a time-lapse camera to capture the results of their experiments on 70 clutches. In the process, Poo and Bickford were able to document environmentally cued hatching among Southeast Asian amphibians, and for the frog family *Rhacophoridae*, for the first time.

Hatching occurred much sooner among clutches of newly laid eggs from which Poo and Bickford removed a section, than among undisturbed clutches. In turn, when katydids fed on older embryos of four days old, leftover eggs tended to hatch within an hour after the incident. In fact, older embryos that escaped becoming katydid lunch hatched one fifth sooner than those of undisturbed clutches.

The speeding up of hatching time is clearly a reaction to the eggs' being preyed upon. It is possibly triggered by chemical cues that are released once embryos are broken, or when the clutch structure as a whole is damaged. The researchers also established that early hatching in this case was not correlated with the size of the female frog that laid the eggs or the amount of time she spends watching over them.

"Both young and old Hansen's tree frog embryos are able to hatch earlier when disturbed," says Poo.



"Hatching is a plastic or flexible event in the <u>life cycle</u> of this frog, because its embryos are able to respond to acute signals, such as predation, by escaping into the next life-stage," explains Bickford, who suggests that this ability gives the frog an adaptive advantage.

**More information:** Poo, S. & Bickford, D.P. (2014). Hatching plasticity in a Southeast Asian tree frog, *Behavioral Ecology and Sociobiology*. DOI: 10.1007/s00265-014-1781-0

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