

# Student researchers help discover world's smallest frog

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*Paedophryne amauensis*, the world's smallest frog species, on a dime. Rittmeyer et al. 2012

When two Cornell undergraduates and a recent graduate went on a field research trip to Papua New Guinea in 2008, little did they know it would lead to entries in the Guinness Book of World Records and a groundbreaking research paper.

The paper, [published in January](#) in [Public Library of Science One \(PLoS One\)](#), describes the discovery of two diminutive [frog species](#), *Paedophryne swiftorum* and *Paedophryne amanuensis* -- the two smallest frog species in the world. The latter is arguably the smallest known vertebrate species.

Michael Grundler '10 discovered *P. swiftorum* while exploring a stream

at the biological field station near Kamiali, Papua New Guinea, where the students stayed for six weeks between June and August 2008. The work involved transects to explore how frog and [insect diversity](#) changes with elevation.

On his knees poking at a millipede, Grundler heard a clicking sound he and others had previously assumed was crickets, but turning his head, he saw a tiny frog inflating its vocal sack.

"When we got back to camp, [Grundler] handed us a bag with a little frog," said paper lead author Eric Rittmeyer '08, a graduate student at Louisiana State University's (LSU) Museum of Natural Sciences. "None of us believed it was an adult, but in frogs, the calls are mating calls, and only [mature males](#) vocalize, so we knew it was an adult."

Rittmeyer, Grundler and study co-author and classmate Derrick Thompson '09 then collected more specimens, which were identified as a new species. The [adult males](#) reach an average size of 8.5 millimeters.

In 2009, Rittmeyer returned to [Papua New Guinea](#) as a graduate student with Christopher Austin, LSU associate professor of biological sciences and curator of herpetology at the LSU Museum of Natural Science and the paper's senior author. This time, near Amau Village, they heard the clicks of another frog and collected specimens of *P. amanuensis* for the first time. While *P. swiftorum* makes a series of double clicks, *P. amanuensis* has "regular single clicks faster than one per second; you could almost set a metronome by it," Rittmeyer said.

*P. amanuensis*, a close relative of *P. swiftorum*, is disputably the smallest [vertebrate species](#) in the world, with adult males averaging 7.7 millimeters in length. There's a dispute as to the actual titleholder of world's smallest: males of an anglerfish species, *Photocorynus spiniceps*, reach a maximum size of 6.2 millimeters. "However, these male

anglerfish lack stomachs are not free living at maturity; instead, they are obligate parasites on the much larger females, which reach a size of over 50 millimeters," Rittmeyer said. Comparing the fish and the frog are not valid, he said.

*P. amanuensis* is listed in the [Guinness Book of World Records](#) as the smallest frog and smallest amphibian, and noted as the smallest vertebrate, though there is no such official category.

In the paper, the researchers examine how 29 extremely small species with a maximum size below 13 millimeters are distributed among all frog families. They found several of the largest [frog](#) families, such as Hylidae (tree frogs) and Bufonidae, do not have extremely small species, while the Microhylidae family has many species on the list, representing seven different genera (evolutionarily distinct groupings of organisms having common characteristics). "This suggests that small body size evolved multiple times within Microhylidae," Rittmeyer said.

They also found that the majority of the smallest frogs have direct development, meaning they hatch from eggs as mini-adults, rather than as tadpoles, and most of them live in leaf litter that stays moist year-round in tropical rainforests. This could represent a previously unrecognized ecological guild.

Provided by Cornell University

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