



The rare Bourret's horseshoe bat of Southeast Asia has a huge nose for a bat of its genus and region, and scientists have been trying for decades to figure out why it got so large. Now we know, reports the Virginia Tech News Service: That big nose is the near-perfect length for focusing sonar beams for echolocation.

The research by Engineer Rolf Mueller, director of Virginia Tech's Bio-inspired Technology Laboratory, and colleagues at China's Shandong University and the Vietnam Academy of Sciences, was set for publication in *Physical Review Letters*.

The scientific name of Bourret's horseshoe bat, *Rhinolophus paradoxolophus*, means "paradoxical crest." The bat's nose averages just over a third of an inch (9 millimeters) in length, about twice that of other horseshoe bats. "This nose is so much larger than anything else" among bats of the region, Mueller said in a news release.

Published under the title, "Acoustic effects accurately predict an extreme case of biological morphology," the Bourret's research is part of a larger study of about 120 bat species and how they use sonar to perceive their environment, especially through the biological sonar system called echolocation, the news release said. The goal of the work is to use bats' echolocation and communication systems to spur innovations in cell phone and satellite communications and in naval sonar technology.

Many bat species use echolocation to hunt and navigate in total darkness, emitting ultrasonic beams from their nostrils, as horseshoe bats do, or their mouths. The echoes that bounce back contain a wealth of information about objects in the environment.

Much of the Bourret's bat's nose is actually an unusually complex "nose leaf" of skin surrounding the nostrils. A number of bats have similar, though smaller, nose leaves and scientists deduced some time ago that they are involved in aiming echolocation calls. Mueller and his team concluded that the size of this bat's nose leaf evolved to an ideal length for focusing sonar beams.

Much like a flashlight that can be adjusted to create a small but intense beam of light, the Bourret's horseshoe bat's nose create an intense, tightly focuses sonar spotlight, Mueller said. The team used computer animation to compare the impacts on sonar beams of bat noses of various sizes. The models show that the Bourret's bat's nose is almost perfect for that purpose – any longer and the beam's focal point would become ineffective.

"By predicting the width of the ultrasonic beam for each of these nose lengths with a computational method, we found that the (Bourret's) natural nose length has a special value: Shortened noses provided less focus of the ultrasonic beam, whereas artificially elongated noses provided only negligible additional benefits," Mueller said.

All articles in this issue:

► [Apply for a Scholarship](#)

Bat Conservation International's™ Student Research Scholarship program is now accepting applications for 2010 awards. Since ...

► [Bats in the News](#)

The rare Bourret's horseshoe bat of Southeast Asia has a huge nose for a bat of its genus and region, and scientists have been ...

► [Reducing Bat Kills at Wind Farms](#)

Efforts to reduce the alarming number of bats that are being killed at wind-energy facilities took a big step forward when ...