

Three new species of yellow-shouldered bats discovered in museum collections

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Scientists at Chicago's Field Museum and international collaborators have reconstructed the phylogeny and biological history for the Yellow-shouldered bats in the New World tropics, the region of the Earth surrounding the equator. In-depth analysis of mitochondrial and nuclear DNA sequences uncovered three species new to science, each having previously been confused with another species. Since 1960, when modern studies on this group began, *Sturnira* has grown from eight species to 22. The newest additions were described in a new study, published online in *ZooKeys*.

The New World tropics have long been recognized as a region teeming with some of the richest biodiversity on Earth. It is home to a group of small, fruit-eating bats ranging from half-an-ounce to three ounces in size. The bats belong to the genus *Sturnira*, commonly named yellow-shouldered bats, which are found from northern Mexico to northern Argentina. One species in particular, *Sturnira lilium*, has figured among the most widespread and locally abundant bats of the New World topics.

"A curator's job is to bring order out of chaos," said Bruce Patterson, PhD, MacArthur Curator of Mammals at The Field Museum. "This group of bats offered an excellent opportunity study the process of species formation across the entire New World tropics."

Paúl Velazco, PhD, who formerly worked at The Field Museum and now is with the American Museum of Natural History in New York, is the lead author on the new study. Velazco and Patterson began their

endeavor by collecting 38 samples of six species from three countries. They also borrowed 94 samples from 24 countries from museums around the world in order to complete the project, highlighting the importance of [museum collections](#) for the growing body of scientific knowledge.

The researchers isolated DNA from a small portion of liver or muscle samples that had been frozen or preserved from each specimen. They then amplified and sequenced two nuclear and three mitochondrial genes from each tissue, amounting to nearly 5,000 base pairs of DNA, from over 120 individuals.

"We chose these genes because they have proven useful for classification of related groups of bats," said Velazco. "Mitochondrial sequences tend to be fast-evolving and informative about very recent evolutionary splits, while nuclear genes tend to be slow-evolving and shed light on more ancient divergence events."

By sequencing both classes of DNA, the researchers could recover the group's entire history, which stretches back about 8 million years.

Every museum specimen that was sequenced already had both a name and a geographic distribution. However, the sequence analysis led the investigators to believe that some of the branch labels were incorrect. Indeed, after re-examining the museum specimens associated with each sample, they found that nearly 20 percent of the specimens had been incorrectly labeled!

How could so many individual animals have been misidentified? The answer lies within technology.

"The differences between species are often subtle, and difficult to describe in writing. The historic literature lacked access to the visual

documentation that we rely on today, such as color photography and digital libraries," said Patterson. "For this reason, small and imprecisely described morphological differences were often overlooked during the original identification of the specimens. This type of error pervades all biological collections."

Their results identified three species entirely new to science, and provided evidence for the elevation of three subspecies to the species level. Two of the new species are described in the *ZooKeys* article.

In the process, Velazco and Patterson were able to revise the supposed geographic range of *Sturnira lilium*. Instead of extending from Mexico to Argentina, the real *Sturnira lilium* is limited to Bolivia, Brazil, Paraguay, Uruguay, and northern Argentina. The rest of its presumed range is occupied by six other close relatives that replace one another in jigsaw-like fashion across the Neotropics.

The distribution of *Sturnira* [species](#) across most of the New World tropics and its diversification throughout its eight-million-year existence make it informative for other sorts of biological reconstructions, such as the seed plants upon which it feeds.

In addition to its scientific usefulness, this study demonstrates the need for the ongoing revision of the Earth's biological history, and highlights the immense value of museum collections in uncovering new knowledge.

"For this particular group of mammals, we are much closer that we were in framing their diversity, although there may be additional *Sturnira* out there," said Patterson. "Over the years, I've learned that no one has the last word in science."

Provided by Field Museum

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