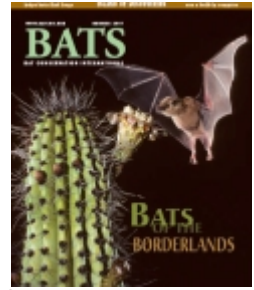


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An Island of Discoveries

Madagascar reveals a swarm of new bat species

Steven M. Goodman



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Madagascar, an island nation off the southeast coast of Africa, teems with unique animals and plants, and a recent surge in scientific attention is producing a flood of new species. Seven bat species previously unknown to science have been described in just the past three years.

Slightly larger than California, Madagascar is Earth's fourth-largest island. It broke free of the African continent about 140 million years ago and split from India 88 million years ago. An exotic suite of flora and fauna emerged as evolution worked in complete isolation. Small primates called lemurs, for example, are found nowhere else, and at least 50 lemur species inhabit the island.

Bat Conservation International has been supporting research and conservation in Madagascar since 1993, when it provided a Student Research Scholarship for a study of flying foxes' contribution to reseeded the island's forests, which had shrunk by more than 80 percent during the 20th century. Since then, nine other BCI scholarships have helped pay for vital research, while two BCI Global Grassroots Conservation Fund grants supported innovative public education and conservation work.

Very little was known about the bats of Madagascar until 1967, when the late Randolph Peterson and colleagues from the Royal Ontario Museum in Toronto launched a major study. Working mostly along the few passable roads, they obtained a wealth of new information and listed 27 species of bats, many of them found only on Madagascar. These results were published in 1995, after Peterson's death, in collaboration with Judith Eger and Lorelie Mitchell.

In collaboration with World Wildlife Fund-Madagascar, our research has been building on that and other pioneering surveys for nearly two decades. We have been conducting large-scale, multi-disciplinary inventories of Madagascar's varied biota with teams of ornithologists, herpetologists, mammalogists, entomologists, botanists and other scientists. They work directly with Malagasy graduate students, who collect and analyze the survey data for their theses and scientific publications. BCI is helping to support portions of our fieldwork.

We have surveyed extremely remote areas, where the only way in can sometimes require a hike of several days with a phalanx of 20 to 30 porters who help carry equipment, food and gear. A less-strenuous journey might involve several days of hard driving in four-wheel-drive vehicles over nonexistent roads, through deep mud and across rivers. As of this past spring, we had visited nearly 400 sites, mostly in poorly studied or virtually unexamined areas. An incredible number of new species have been discovered, including lemurs, rodents, shrew-like tenrecs and, of course, bats. Probably no other area of similar size, except the Philippines, boasts so many recently described mammal species.

Bats were added to these surveys in the late 1990s, partly to complete the small-mammal inventory. Also, at about the same time, scientists associated with the University of Aberdeen (in the United Kingdom) launched a research program focused on Madagascar bats, beginning with fruit bats, then expanding to the complete bat fauna.

Our results have been exceptional. As of this past March, 37 bat species are now confirmed for Madagascar, and 26 of them are found only on the island. Of the 10 species added to the list since the work of Peterson and colleagues, seven that are new to science have been

described since 2004.

We are currently developing descriptions of several other previously undescribed bat species, and we estimate that Madagascar and its surrounding islands are home to at least 45 species. We base this impressive species increase on sufficient samples from enough localities to confidently differentiate separate species from variation within a species. Additionally, molecular analyses provided powerful insights into the differentiation of populations.

An especially notable result of our research greatly expanded knowledge of the remarkable sucker-footed bats (family *Myzopodidae*), which had been considered a single rare endemic species. These bats have sucker-like structures on their wrists and ankles that allow them to scramble up smooth surfaces such as large leaves. They are found only on Madagascar, although several species of Central/South American disc-winged bats (family *Thyropteridae*) independently evolved similar leaf-climbing features.

Our surveys clearly revealed that, at least in eastern Madagascar marshes where the broadleaf plant *Ravenala* grows, the known sucker-footed species (*Myzopoda aurita*) is not as rare as had been believed. During BCI's 2005 Founder's Circle Expedition to Madagascar, we had the great pleasure of capturing eight of these bats in just a few minutes and showing BCI Founder Merlin Tuttle a family of bats he had not previously handled, let alone photographed.

Armed with new information about the habitat favored by this genus, researchers visited areas of western Madagascar with similar plants and features and soon discovered an undescribed species of *Myzopoda*. In early 2007, the animal was named *Myzopoda schliemanni*, or Schliemann's sucker-footed bat.

One of the daintiest of our new species is a tiny member of the genus *Emballonura*. It weighs less than five grams (about the weight of a U.S. nickel). This genus, represented by *E. atrata*, was very poorly known on the island. Madagascar has a moist tropical forest on its eastern side and dry forests in the west, and it became clear to us that these sharply different zones did not hold the same species of *Emballonura*. We knew we had two species and one of them was new to science, but our problem was determining which was which.

The description of *E. atrata*, written in 1874, gives the locality as "œaus dem Innern von Madagascar" (œin the interior of Madagascar"). That's a bit vague for our needs, so we visited Berlin, Germany, to examine the type specimen (the preserved animal originally used to describe the species) in the Museum für Naturkunde at Humboldt Universität. That promptly resolved the issue: Our western bat was named *Emballonura tiavato* in late 2006. The species name means "œerock-dwelling" in Malagasy.

We also developed a fascinating collection of pipistrelles. Peterson and colleagues had reported only a single specimen of this almost globally widespread genus on Madagascar, and they could not identify it. However, we captured many pipistrelles at numerous locations. A taxonomic study led by Paul Bates at the Harrison Zoological Museum outside London determined that these bats represented at least six different species of pipistrelles, including one new to science. It was named *Pipistrellus raceyi*, or Racey's pipistrelle bat, in honor of Paul Racey of the University of Aberdeen (a BCI Science Advisor). As a measure of how little is known about Malagasy bats, the descriptive animal for this new species was collected in the wall of an occupied house near a village hospital.

Despite enormous progress in identifying and understanding the bats of Madagascar, much remains to be learned about their ecology and natural history. Most of it no doubt will be learned by a small, but growing troop of homegrown scientists. There are now more than 15 Malagasy students and researchers interested in studying the bats of their island.

This research is helping to push bats firmly onto the conservation agenda of Madagascar, due largely to the efforts of two Malagasy nonprofit organizations: Vahatra and

Madagasikara Voakajy. The latter group grew from the work of University of Aberdeen researchers. The future of bat conservation in this fascinating island nation is definitely improving.

STEVEN M. GOODMAN, Senior Field Biologist at the Field Museum of Natural History in Chicago, Illinois, is one of the co-founding members of Vahatra, and for nearly 15 years coordinated a project for WWF-Madagascar in Antananarivo. A new species of lemur, *Microcebus lehilahytsara*, bears the common name Goodman's mouse lemur in his honor, and lehilahytsara is the Malagasy word for "good man." In 2006, Goodman was named a MacArthur Fellow.

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