

New species discovered in Malaysian rainforest during unprecedented, top-to-bottom survey

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The Malayan forest gecko (*Cyrtodactylus pulchellus*) is endemic to Penang, meaning that it is found nowhere else on Earth. Credit: © 2017 Phil Torres/bioGraphic

This fall, the California Academy of Sciences partnered with The Habitat Penang Hill and colleagues to conduct a top-to-bottom rainforest survey unprecedented in its comprehensive approach. On Malaysia's island state of Penang, a 117-member team of scientists documented flora and fauna from the tops of towering trees to the dark reaches of damp caves. Over the course of two weeks the international team discovered several species previously unknown to science—including a new species of scorpion and likely new species of fly, water bear, and bacterium—living just miles from a major metropolis. The expedition also tallied new regional sightings: birds, bats, orchids, mammals, flies, ants, mosquitoes, spiders, and frogs never known to occur in Penang were documented for the first time. Survey results (which included the canopy and not just the forest floor) will advance the understanding of this little-explored rainforest and contribute to its future nomination as a [United Nations Educational, Scientific, and Cultural Organization \(UNESCO\) biosphere reserve](#).

"This forest is special because it stands protected in a region of the world facing rapid deforestation," says [Dr. Meg Lowman](#), the Academy's Lindsay Chair of Botany and expedition leader. "It's also important as a pristine rainforest located so close to a major metropolis. Yet prior to this survey, which included the often forgotten canopy, we knew very little about what lived there."

Experts from the Academy, [Universiti Sains Malaysia \(USM\)](#), and other partner institutions participated in the effort to create a comprehensive catalogue of the forest's inhabitants. From-the-field updates were broadcast digitally by [JASON Learning](#) to classrooms around the world and over 1,400 [species](#) observations were logged on the nature-tracking mobile app [iNaturalist](#). Formal findings are now being compiled to support a UNESCO nomination in 2018.

A [gallery of expedition photos](#) appeared today in the online magazine

[bioGraphic](#) and are available to any interested media outlets upon request. Interviews with scientists, additional hi-res photos and [video](#), and a more detailed list of findings are also available upon request.

Many firsts

During the two-week survey of Penang Hill—a rolling, mountainous landscape thick with tropical hardwood trees—the international team created species lists that will contribute valuable data for mapping the region's distribution of wildlife. In their tireless scan of the forest, the scientists encountered many species likely new to science.

In an exciting nighttime collection, Academy arachnologist [Dr. Lauren Esposito](#) and post-doc Dr. Stephanie Loria discovered a [new species](#) of scorpion belonging to one of the oldest lineages on Earth, known as the ghost scorpions. This group is native to Southeast Asia and fluoresces when under ultraviolet light (like all scorpions), but they do so faintly enough that spotting them is incredibly difficult.

"We had a hunch this new species was out there," says Esposito, "but it was really a matter of odds. For every hundred logs or so we turn over, we find a scorpion. We got lucky."

Other notable finds likely new to science include a species of iridescent fly that lives among coastal palm-like plants and a species of tardigrade (or "water bear"). These microscopic, aquatic animals inhabit moss and lichen in trees and are found on all seven continents. Zoologists from USM also managed to capture a sought-after recording of the elusive, cryptic colugo (or flying lemur), which will add valuable new insights into how these nocturnal gliding mammals communicate. Detailed findings will be published in the coming months.

The expedition also logged several species known to science but never

recorded in Penang: the spectacular Red-rumped Swallow and Stripe-throated Bulbul; the spotted-wing fruit bat; one species of vibrant orchid; three groups of algae found in flowing water; eight species of mammals (including the peculiar lesser mouse deer); two species of frogs; several species of flies (including one that mimics ants); five groups of ants (one group being the Dracula ants named for devouring their own young); two species of mosquito; and the segmented funnel-web spider *Macrothele segmentata* not seen since its original discovery and description in Penang in the late 1800s.

"Over the next few months and years, the team will analyze the specimens collected during the expedition and undoubtedly discover more new species along the way," says Lowman. "Penang's forest is bursting with undocumented diversity—especially in the treetops, where no one had surveyed before."

Unlike the traditional expedition model, in which findings are often not published until months or years after the fieldwork has concluded, scientists began sharing their highlights while still in the field. Using the mobile app [iNaturalist](#), scientists rapidly shared their observations with the wider community and engaged regional experts not necessarily in the field to help with species identifications. At the end of the expedition, a full-day symposium in George Town was held to share results and begin compiling data in support of UNESCO nomination.



Zoologists from Universiti Sains Malaysia managed to capture a sought-after recording of the elusive Sunda colugo (or flying lemur), which will add valuable new insights into how these nocturnal gliding mammals communicate. Credit: © 2017 Phil Torres/bioGraphic

Toward UNESCO nomination

The island state of Penang sits at the crossroads of culture, history, and cuisine. Its capital city, George Town, is already a designated UNESCO World Heritage site. Every year, over one million visitors to the bustling city travel fifteen minutes by train to the tranquil summit of Penang Hill where they take in panoramic views of the landscape's timeless beauty. The forest has become a beloved icon for many island residents and visitors, emerging as a beacon of sustainability for the country and world at large.

"All of us have a common future in our forests," said Penang's Chief Minister, the honorable Lim Guan Eng, during the survey's closing events. "Forests are critical for our health. If you keep and protect and preserve your rainforests, people will come to enjoy and celebrate them."

With critical support from The Habitat, efforts are now underway to list Penang Hill as part of a proposed UNESCO biosphere reserve under [UNESCO's Man and the Biosphere Programme](#) in 2018.

"The comprehensive biodiversity assessment is a vital step towards obtaining the UNESCO biosphere reserve listing which would be fitting recognition for these forested hills that have endured for generations," says Reza Cockrell, co-founder and director of The Habitat and [The Habitat Foundation](#).

If successful, a UNESCO listing will allow the landscape to continually inspire, awaken curiosity, and cultivate support for rainforest conservation among the thousands of Malaysians and international visitors that make their way to Penang Hill each year.

Highlights by the numbers

130,000,000

The rainforest on the island of Penang encompasses a series of hills overlooking the modern metropolis of George Town and is thought to be 130 million years old. It is considered primary forest since it has never been cut down before.

19,768

The biodiversity survey occurred within The Habitat and the adjacent

Bukit Kerajaan Forest Reserve, which was originally established as a Virgin Jungle Reserve in 1911. Contiguous forest reserves, water catchment reserves, and Penang National Park together comprise approximately 19,768 acres (or 8,000 hectares). Regional partners continue to advocate for rainforest conservation in Penang, Malaysia at large, and the world.



Academy arachnologist Dr. Lauren Esposito and post-doc Dr. Stephanie Loria discovered a new species of scorpion belonging to one of the oldest lineages on Earth, known as the ghost scorpions. The group is native to Southeast Asia and fluoresces when under ultraviolet light (like all scorpions), but do so faintly enough that spotting them is incredibly difficult. Credit: © 2017 Phil Torres/bioGraphic

5236

Tree-climbing scientists from the Academy, UC Berkeley, [The Tree Projects](#), and other partner organizations climbed 5236 vertical feet during this first-ever canopy survey in Malaysia. Over half of any forest's biodiversity lives in the canopy, making the treetops a critical and often overlooked area of study. Scientists climbed several rare and endangered tree species on Penang Hill to document the orchids, ferns, and epiphytes (or air plants) thriving at such heights and to press leaf samples for further study. Fifty-nine mammals were also documented through motion sensitive cameras, including lively macaques, dusky-leaf monkeys, tree rats, and flying squirrels (images available upon request).

1424+

Over 1400 species were recorded via [iNaturalist](#), the nature-tracking mobile app that uses a community of online experts to confirm observations. This number will continue to climb as participants process observations in the coming months.

47

A combined forty-seven students from local schools, World Wildlife Fund Hong Kong, and JASON Learning met scientists in the field to experience fieldwork firsthand. Daily [video dispatches](#) (courtesy of JASON Learning) earned over 3,000 unique viewers from around the globe on YouTube and 69,000 unique viewers on Facebook.

25

At least twenty-five plants and animals observed during the survey are new records for Penang or peninsular Malaysia, including the Sunda colugo or flying lemur, the red giant flying squirrel, the long-tailed giant

rat, the Indomalayan niviventer, the lesser mouse deer, and species of ground squirrels, birds, bacteria, bats, ants, orchids, flies, frogs, mosquitoes, and microscopic water bears.

4

Four species found during the survey are likely new to science (a scorpion, fly, bacterium, and water bear). However, confirming species discoveries takes months and oftentimes years as scientists carefully sort, study, compare, describe, and potentially revise their contributions to the tree of life.

1

One thriving rainforest up for UNESCO nomination.

Provided by California Academy of Sciences

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